The
GEOGRAPHICAL JOURNAL

Vol XCII No 2 R.G.S. *August 1938*

ADDRESS AT THE ANNUAL GENERAL MEETING

of the Society held on 20 June 1938, by the President

PROFESSOR HENRY BALFOUR, F.R.S.

DURING the Session the Society has suffered many losses from its Fellowship, several of which call for special reference.

The name of *Major-General Lord Edward Gleichen* will be associated always in our minds with the Permanent Committee on Geographical Names for British Official Use; he had presided over it from the date of its establishment in 1919 as a kind of Interdepartmental Committee with which the Society was associated and for whose labours it provided the necessary quarters and much of the material. To the work of this Committee Lord Edward gave his unremitting care and interest, and brought to it a very wide knowledge of the problems to be faced in finding the best solutions of complex difficulties. For he had in his very active life as an officer of the Grenadier Guards extensive experience of many kinds: on active service, as Military Attaché to foreign Courts, of Special Missions, and of military Intelligence. To all these interests he brought the advantages of distinguished family and of great gifts, with a singular modesty. He had served on our Council for many years until ill-health caused him to limit his activities. After much suffering he seemed to take on a new lease of life: unfortunately all too short.

Sir Harcourt Butler, on his retirement after a most distinguished career in India and Burma, brought his financial and administrative experiences to the service of our Society as member of Council, Vice-President, and Treasurer. Few had a profounder knowledge of India and her peoples, and this enabled him to make valuable contributions to the discussions at our evening meetings. Through his death the Society has lost a loyal adherent and a wise Councillor.

Colonel Sir W. Coote Hedley was Chief of the Geographical Section, General Staff, at the outbreak of war in 1914, and from August 3 the remaining staff of the Society, reinforced by a continually increasing number of volunteer assistants, were engaged on work inspired and controlled by him. Our recollection of him is of a man always open to receive new ideas and always

careful not to adopt them too quickly. When the Society proposed to him to make a provisional edition of what should have been the International Map he limited the proposal to six sheets at the start, and before the end of the war we had compiled 106 sheets for him. He was of the finest type of Royal Engineer officer, with a wide general knowledge, with a special knowledge and skill in map reproduction and printing, and with an extreme natural aptitude for all ball games. The account of his services has been so recently written in our *Journal* by Brigadier MacLeod that we need not retrace it. Those who were under him during the war in either military or civil employment will keep his memory in affectionate regard.

The familiar figure of *Lord Leigh* will be greatly missed at our meetings, for until within a few days of his death at the age of eighty-two he rarely missed a meeting of any kind, from the most severe technical discussion at an Afternoon Meeting to a Christmas Lecture to Young People. He was Lord Lieutenant of Warwickshire and played a great part in the county's affairs and in the hunting field, despite a severe injury in early life.

Sir Robert Williams, who died in April, had rendered great service to the world by his enterprise in the improvement of communications in South Africa, and his name will be associated especially with the Benguela railway, for whose engineering and finance he was largely responsible. It must have been a difficult task to adjust the conflicting interests of a railway through the territory of one power designed to attract the traffic from the territory of two others; and the completed work is a monument to his skill and his charming personality.

Mr. George Philip was the head of the well-known firm of map publishers who took always a strong interest in the developments of cartography, and was especially anxious that the publications of his firm should conform to the decisions of the P.C.G.N., on which Committee he was one of the Society's representatives for many years.

Mrs. W. E. Oates had been a Fellow of the Society from the time when her son played his heroic part in the story of Captain Scott's return from the South Pole and had devoted her life to his memory.

Major F. G. Jackson will best be remembered for his leadership of the Jackson-Harmsworth Expedition to Franz Josef Land in 1894–97. Little was then known of this region, which the expedition's work proved to be an archipelago. In the course of the three years, Jackson and his companions surveyed the western islands and the British Channel, maintained a meteorological station at Cape Flora for one thousand days, and made geological and natural history collections. In 1896 Jackson met Nansen and Johansen after their journey across the polar ice from the *Fram*, and sent them back to Norway in his vessel, the *Windward*. In later life Major Jackson served in the Boer War and the Great War, and made extensive hunting expeditions in Central Africa.

Captain M. W. Hilton-Simpson was an authority upon the Berber tribes of the Aurès mountains. Much of his success was due to his ability to establish friendly contact with these peoples in their sports and work. He was thus able to investigate important aspects of their culture before they were appreciably altered by outside influences. His most valuable contribution was a

detailed investigation of the surgery and medicine of the Shawiya, which he carried out at my request. It was an important piece of research and revealed a survival of the early Arab therapeutics, which formed the main basis of western medical development.

Mr. Thomas Gann, who died last February, was a medical officer in the service of British Honduras, where he combined with a love of travel a taste for archaeology. It was largely owing to his enterprise that the British Museum sent the expeditions ' Lubaāntūn under Mr. Joyce, in 1926 and 1928, which made an important contribution to our knowledge of Central American archaeology and art. Mr. Gann had published some half a dozen books on the Maya cities and people.

The murder of *Mr. James Leslie Starkey* in Palestine in January is still fresh in our minds. By this wanton act the life of a distinguished archaeologist was very prematurely cut short. Egypt and Palestine had been the scenes of his chief work.

Captain H. W. Seton-Karr was a familiar figure at our meetings. He travelled widely as a big-game hunter and led many parties. Although he was not a trained archaeologist, he made very important and extensive collections of prehistoric implements in Egypt, Somaliland, and South India, and in this way made valuable contributions to the science.

I feel bound to call your attention to the sections of the Report of the Council dealing with the Fellowship of the Society. We had hoped at the end of 1936 that the effects of the financial depression since 1930 were passing, since the figures at the end of that year showed a cheerful recovery from the relatively slight but still serious falling off in our numbers which is set out in the Report. But 1937 was disappointing. More candidates than usual failed to take up their Fellowship after they had been proposed and elected. A larger number felt compelled to resign, specifying always the financial difficulties of the time; and a correspondingly larger number had to be struck off from the list as in arrear with their subscriptions. May I emphasize what was said in the Council Report, that a Fellow should think twice in proposing to economize in the support and enjoyment of his intellectual interests. In times when taxation is high and increasing, to economize by striking from one's list of subscriptions the names of scientific societies is perhaps natural, but I would emphasize the belief of the Council that it is not inevitable, and would repeat their request for reflection upon the loss of serious interest in life and upon the injury done to the nation if the work of scientific societies is not supported in critical times. It should need but little effort to bring on to the roll of the Society many of those who are brought as guests to our meetings, and are interested in its work; they will need only a little encouragement and the removal of the mistaken notion that Fellowship of the Society is only for those who have played an active part in exploration or the scientific study of our earth.

Our Council Report sets out several generous benefactions to the Society within the last year, and on this occasion I would direct the attention of benefactors to two ways in which the Society has benefited. The first is in the Expedition Fund. It was established by a legacy from a distinguished mountaineer and traveller, the late Mr. A. L. Mumm; and with the assistance

of generous gifts it has done much in the last ten years to supplement the sums provided from our budget for the assistance of expeditions. But the fund is now exhausted. It must, if possible, be re-established for the benefit of the yearly increasing number of young and ardent explorers who require some financial help if they are to gain in early life the training and experience which will bring the most talented of them to fame in our annals. The second benefaction to which I refer is that from the estate of the late Herbert Spencer, who provided that its residue should be divided between twelve learned societies, with the condition that the money was not to be invested but spent within five years. Nothing could be more welcome to a society continually faced with the requirements of its buildings or its equipment at a time when there has been little surplus to devote to extraordinary expenditure. Our Library, our Map Room, and the improved projection in this Hall have all benefited.

Our special publication of the year, the second volume of 'Hints to travellers' in its eleventh edition, has met with such success that it may become a best seller amongst our Special Publications; it contains the cream of the observations made by our best travellers in the last ten or fifteen years on the technique of travel, expressed very often in their own words as recorded in our *Journal*, and often very amusingly put. May I commend this book to those who are looking for a suitable present for a friend who wishes to travel, or who, living in a distant part of the world, may be glad to know what are the traveller's recent contributions to the art of making himself comfortable and keeping well.

I come now to expeditions recently returned from the field.

The work of the *British Graham Land Expedition* has this afternoon been marked by the award of the Founder's Medal to its leader, and we have had preliminary accounts of the results. Different members of the scientific staff are still engaged upon the detailed discussions of their collections. I would mention in particular one problem which is now engaging the Society: how to adjust the flights of Wilkins and Ellsworth to the ground control furnished by the surveys of this expedition. The Society has already seen how deceptive may be the appearance of glaciated land from the air, the disappearance of the straits which had been plotted from the air reconnaissance of Wilkins, and the way in which the discoveries of the British Graham Land Expedition have already modified the first interpretation put upon the photographs of the Ellsworth flight by the American Geographical Society. But there are still many problems to be solved at which Mr. Stephenson is hard at work, and we look forward to hearing next winter the extent to which solution has been found.

The work of the *Shaksgam Expedition* of last year under the leadership of our other Gold Medallist should rank among the most successful of recent mountain explorations. There were large gaps north of the main Karakoram range in the map which the Society has had long in preparation. Very happily some of the most considerable have now been filled by the surveys of the four members of this modestly equipped but very successful and hard working party. They have in the best possible way delayed the publication of our map by providing so much additional material.

Lord Moyne's expedition in S.Y. *Rosaura*, which included visits to eastern Greenland and Central America, did not lack variety; but its outstanding feature was a visit to the Bay Islands, off the coast of Spanish Honduras, during which he made a collection of archaeological specimens of very great interest and of considerable scientific importance. An exhibition of these finds was held at Lord Moyne's house.

We have heard during the session the results of *Mr. Wordie's* latest expedition to the Arctic, and can realize what demands the scientist now makes upon the programme of an expedition which intended to investigate the upper atmosphere. Favoured by suitable weather, they were able to recover more than one might have expected of the records made by the delicate self-registering apparatus in free balloons; and the requirements of this work did not prevent an extensive new exploration which will, when the map is completed and published, make a valuable contribution to the Arctic chart. The study of early Eskimo cultures will be advanced by considerable collections excavated from ancient sites.

Miss Lindgren and *Mr. Andrew Croft* have returned recently from an anthropological journey to Lapland, of which we shall hope to hear next session.

A recent extension of the Aden Protectorate to include the Hadhramaut has given us this session at our last meeting a remarkable paper by *Mr. Harold Ingrams*, relating not only his reconnaissances, largely by air, of hitherto unknown districts, but what is of even more importance, the success of the British Resident at Mukalla in negotiating for the cessation of hostilities between neighbours who were sometimes, until this last year, unable to leave their houses except by communication trenches to their farms. This picturesque feature in the life of the Hadhramaut has almost disappeared, and the way is open to a scientific study of irrigation, of agriculture, and of public health, which may do much in the future for that most interesting civilization whose details we have heard only in the last few years.

During last winter *Miss Freya Stark*, *Miss Caton-Thompson* and *Miss Gardner*, all three names familiar to the Society's publications, have been at work in this area. We look forward to hearing their results in the coming session.

Last November *Mr. Lars Christensen* gave us a brilliant sketch of the work of exploration which has been done by himself and his officers in the Enderby quadrant of the Antarctic. These inhospitable coasts have now in great part been photographed from the air, and the difficult work of mapping them is in progress. We are grateful to him for placing at our disposal the latest maps of the Whaling Association, and the publication of his paper has been delayed in order that we may be able to show for the first time on the same map the Norwegian and the British contributions to the geography of this quadrant. It is so inaccessible that very few landings have ever been made, and consequently there is hardly any ground control for the photographs. We hope that the map which will accompany his paper when it is published will demonstrate the desirability and emphasize the complexity of coming to an amicable agreement on names in this territory, largely in the Australian sector, that has at present such a superfluity of them and so little geographical detail.

A Member of our Council, *Major Bagnold*, has recently returned from a further expedition to the Libyan Desert, not this time so much for exploration as for the study in the field of those problems of desert sand which he has been investigating of late in the laboratory. The many strange sand formations in the Lut of Iran, so beautifully portrayed to us by Doctor Alfons Gabriel in his recent lecture, show how extensive is the field of research in this subject.

We had recently the pleasure of a visit from *Doctor Wilhelm Filchner*, who has communicated to us a brief account of the scientific results obtained upon his latest great journey across Sinkiang: a journey in which he suffered much from the disturbed politics of this region, but with his usual determination was able nevertheless to carry out a great part of his programme of magnetic survey and to make his usual great addition to the list of astronomical positions. Meanwhile his colleagues in Germany have produced another substantial volume and a further map, the fruit of his earlier journey.

An outstanding event, which has brought vividly to our attention the opening up of routes in the Middle East, was the state visit which the Earl of Athlone and the Princess Alice paid this spring to the King of Sa'udi Arabia. This enterprising journey stands out conspicuously not only as a new departure, since it was the first visit paid to the region by members of our Royal Family, but also as a masterpiece of organization, and, above all, as a symbol of the cordial relationship which has been established between Great Britain and Sa'udi Arabia. The royal visit has done much towards cementing that spirit of friendship.

Although unconnected with the operations of the Royal Geographical Society, reference should not be omitted to the remarkable 1500-mile drift on the polar ice from the North Pole to Scoresby Sound, which was successfully accomplished by four Russian scientists. The drift upon the ice-field lasted nine months and the small party was finally rescued as the floe was breaking up in the neighbourhood of 70° N. The scientific results of this venture will be awaited with interest.

I turn now to expeditions in the field, and begin with the *Mount Everest Expedition*, which this year has a rather special character. The Mount Everest Committee, in which our Society shares with the Alpine Club the responsibility for the whole series of Mount Everest Expeditions, were aware of a strong body of opinion that expeditions in the past have been too large and over-burdened with supplies and subordinate personnel. It was easier for the Committee to be convinced, because the cost of recent expeditions had almost depleted the funds which they had maintained for so long by making the proceeds of newspaper rights, lectures, and book from one expedition pay for that expedition and leave a certain balance for the future. The present expedition, led by Mr. H. W. Tilman with a relatively small but highly expert and distinguished band of climbers, has been organized on the principle that it should travel as light as possible, abjure comforts and luxuries, and in particular should say as little as possible of its doings. Cut off then from the doubtful benefits of reports by wireless we have remained in a pleasant state of ignorance and expectancy. We have heard of their safe and timely arrival at the base camp, the establishment of camp III, and the

impossible weather conditions for an early attempt upon the mountain; and we have heard, but not from them, of an early breaking of the monsoon. On the principle that the weather is always different from what one might expect we have remained in the confident hope that a sufficient period of fine weather will have given them the opportunity of success at last. Recent rumours may be disregarded and we are content to await official information from the leader.

Sir Aurel Stein in spite of his seventy-six years continues indefatigable in his antiquarian research, and has this last winter, with the essential aid of the Royal Air Force, been pursuing in 'Iraq his search for the Roman frontier stations which marked the limits of their Empire. His work will form a principal part of the British contribution to the eastern sheets of the special series of the International Map, on the scale of 1/Million, which is now making excellent progress in the charge of a Commission of which Mr. O. G. S. Crawford is the Secretary.

Mr. Ronald Kaulback, accompanied by Mr. A. J. E. Howey, has returned to the Burmese borders of Tibet, and we hope that he will in due time receive permission to cross the frontier and resume those highly accomplished explorations and surveys of whose first part he recently gave us so excellent an account.

His former companion, *Mr. John Hanbury-Tracy*, is with his wife *en route* for the Andes on an expedition primarily devoted to natural history, but which will have strong geographical interests.

Mr. Evert Barger, with a small party of surveyors and archaeologists, is on his way to north-eastern Afghanistan with the cordial assistance of M. Hackin. We must gratefully acknowledge the friendly way in which M. Hackin has invited this party to co-operate with the French in a territory in which they had obtained a prior interest.

In Africa *Mr. V. E. Fuchs*, with one companion, is resuming his work on the structure of the country, this time in the Rukwa Rift Valley of south-west Tanganyika; and we were glad to learn from a recent letter that on their way they were able to do important work in the neighbourhood of Lake Baringo.

In the Arctic *Mr. Manning* continues the work based upon Southampton Island of which we have had brief accounts from his letters and from the reports of Messrs. Baird and Bray, who were with him in his first year.

A recent telegram from *Mr. Haig-Thomas* announces the discovery of a new island west of Axel Heiberg Island, and thus gives us the welcome news that he has overcome the transport difficulties which we had feared might hold him up, and has been able to extend the work in which he took part as a member of the Oxford University Ellesmere Land Expedition. Mr. John Wright has doubtless been with him, while Mr. Hamilton has remained in northern Greenland for the prosecution of his physical researches.

Another member of that expedition, *Mr. Bentham*, has been for more than two years based upon Craig Harbour, where he has received much assistance from the detachment of the Royal Canadian Mounted Police at that station. This spring he was proposing to sledge to Axel Heiberg and adjacent islands with the assistance of two Greenland Eskimos, for whose services he had arranged with the Director of the Grønland Styrelse. We have been sorry to

learn that illness had prevented these Eskimo crossing to Ellesmere Land, which may have seriously interfered with his plans.

A recent brief visit from Sir Hubert Wilkins gave us the news that *Mr. Lincoln Ellsworth* is fitting out the *Wyatt Earp* for another flight in an area not yet revealed.

Meanwhile under the direction of *Mr. Gerald Seligman* a strong team of physicists is at work on the physics of glaciers at the scientific station on the Jungfraujoch, hoping particularly to elucidate the process by which firn snow becomes glacier ice.

In October last the Society was asked by the Royal Commission on the Geographical Distribution of the Industrial Population to submit a Memorandum on the subject of the inquiry, with particular reference to the geographical and atmospheric conditions. Under the terms of reference the Commission is to inquire into the causes which have influenced the present geographical distribution, possible future trends, disadvantages arising from the concentration of industries, and the remedial measures which might be taken. The Council accordingly appointed a committee of Fellows which, under the chairmanship of Professor E. G. R. Taylor, has prepared the memorandum. The basis is a series of maps showing the distribution of the relevant factors, and this has been prepared with the assistance of members of University Departments of Geography. These maps were exhibited in the Ambulatory for some weeks, and at the afternoon meeting of the Society on May 16 Professor Taylor opened a discussion on the subject. The views put forward at that meeting have been considered and the Memorandum drawn up by Professor Taylor and her collaborators is now ready for submission to the Royal Commission.

The assembling of all this relevant material on to maps has not been attempted before and has taken a great deal of time, and it brings out very clearly how urgent is the need for a National Atlas of Great Britain on which such matters can be shown. Much credit is due to Professor Taylor and her colleagues who have carried out this important piece of geographical research.

When it met in Warsaw in 1934 the International Union of Geography resolved that the interval between its meetings should be changed from three to four years, that the next meeting should be held in Amsterdam at the invitation of the Royal Netherlands Government, and that our Past President, Colonel Sir Charles Close, should be President of the Union. We look forward then with especial pleasure to the meeting on July 18 in Amsterdam, the city of Hondius, when our Society will be represented by several Official Delegates and doubtless informally by many of our Fellows, anxious to take full advantage of this opportunity to meet their foreign colleagues in such pleasant and hospitable surroundings.

In January last the Geographical Society of Finland celebrated the fiftieth Anniversary of its Foundation, and we much regretted that it proved impossible at that busy time of year to send a Delegate to represent us in person on this occasion. We trust that our scientific friends in Finland realized that it was from no lack of goodwill that our good wishes to them had to be conveyed by a letter from the President, with a present to their Library of our reproductions of the Hondius and Este Maps.

In May we were invited to the celebrations of the Franklin Institute in Philadelphia and were happy to find in Professor George Barbour, lately gone to take up an important Professorship at Cincinnati, a distinguished Fellow of the Society who represented us worthily on that occasion.

At our monthly meetings for the Exhibition of Films of Geographical Interest we have had remarkable demonstrations of the success with which travellers have used the Kodachrome film, even with little or no previous experience. The pictures of life in Lhasa and its neighbourhood made by Mr. B. J. Gould and his staff on their recent Mission; of southern Greenland and of South American volcanoes shown by Lord Moyne; and the very recent products of a journey by Mrs. Patrick Ness to Indo-China and the Dutch East Indies are vivid in our memory; and Mr. Frank Smythe in January showed to us some of the first-fruits of the same process now made available for cameras which take still pictures on films of standard 35-mm. size. No small part of the success with which this process can be worked in tropical countries may be due to the relative ease with which the exposed film can be returned by air mail for processing in England. The problem of projecting a still picture in Kodachrome only 36×24 mms. without destroying it by heat has necessarily engaged our attention, and the successful results of an experimental adaptation of our projector must now require us to make some further addition to the outfit of our projection room.

Since this Society in its evidence to the Departmental Committee on the Ordnance Survey (see *Journal*, 88 (1936) 489) laid stress on the necessity for utilizing in England those applications of stereogrammetric survey which have been so highly developed on the continent of Europe and so seriously neglected in our country, we have not been in a position ourselves to instal at the Society's House a plotting machine for general purposes, such as dealing with rather unsystematic oblique photographs of the kind obtained by expeditions like the British Graham Land Expedition; these obliques would be especially suitable for more systematic reconnaissance survey in the British Dominions. The relative merits of the most successful continental machines have been carefully studied, and if it were possible to obtain the £5000 or so required to purchase such a machine, we should immediately instal it, for we have now on the staff of the Society a part-time Assistant Research Officer in Survey, Mr. Michael Spender, a man who has very wide knowledge of the subject. This is another object which I commend to the potential benefactor; and on this occasion I would say a word upon the policy of the Society in buying occasionally an instrument of foreign manufacture. We are sometimes accused of a preference for and prejudice in favour of foreign apparatus, only because we have on two or three occasions bought a foreign instrument which was manifestly much superior to anything produced in our own country; and we may point to subsequent improvements in British instruments directly traceable to the example of the foreign. When, as in the case of stereo-plotting machines, great sums of money have been expended in developing the workable machine, and the experience and knowledge from years of trial and development have been devoted to perfecting a model which is widely in use, it has seemed to us merely wasteful to suggest that a British manufacturer should be commissioned to start to

design a British machine on the same lines. The relatively small amount of money available for experiment and development would be much more profitably employed in improving machines which have not been perfected elsewhere. Meanwhile there has been immense extension in the applications of these stereo-plotting machines. We are told of an establishment in Tehran where the photographic surveys for a railway are being plotted by trained Iranian operators, and we have heard quite recently that an establishment in Holland is working with treble shifts and several machines on behalf of an oil company mapping Dutch New Guinea. It will be lamentable if these now well-tried methods are still unavailable for British surveys.

A cursory and condensed survey of the recent activities of the Society must necessarily be incomplete, but enough, perhaps, has been said to indicate that the Society is very much alive and that its useful scientific work proceeds unchecked. Financial limitations are, indeed, the only restraining factor. Were funds available, we could, with the help of our skilled and willing staff, probe more deeply into the very varied and important problems which fall within the ambit of geographical study. May the Society's efforts in the cause of science meet with the financial support which they deserve.

Since this is the last occasion upon which it will be my privilege to address the Society as its President, may I conclude this address by expressing my very deep appreciation of the honour which was conferred upon me when I was called upon to hold this high office. The privilege is one which I have valued more than I can say. My great regret has been that, owing to persistent ill-health, I have been prevented from that regular concentration upon the duties of my office which I had fervently hoped to achieve. Thanks to the ever kindly co-operation of my colleagues on the Council, and to the efficiency of the Staff, the Society, at any rate, has not suffered from my enforced absences. But I regret especially my having to be an absentee upon this particular occasion, since I am cheated of the opportunity of offering in person the cordial thanks which I owe to the Society and to the Officers and Staff. My gratitude has been fully earned by Professor Mason, who, at considerable inconvenience to himself, has kindly acted recently as my deputy.

THE LAND OF SHEBA

H. StJ. B. PHILBY

Continuation of the Seventh Asia Lecture from the July Journal. Evening Meeting of the Society, 15 November 1937

From Najran I started south on 25 July 1936, and it was not till October 12 that I returned after a very thorough exploration of the land of Sheba (see folding map). In addition to the two cars I had a caravan of twenty or twenty-five camels carrying petrol, stores, and water in addition to my escort of eight Najdis and fifteen or sixteen local Arabs representing the many tribes I would encounter on the way. The bulk of these were Yam, but I had with me representatives of the Sai'ar, Karab, Qahtan, and Dahm tribes, who would frank me through all the country between Najran and Hadhramaut. At Khadhra, the last well of the Najran valley, we made our rendezvous, where the hospitable Wahhabi governor came to see us off and bid us God-speed. No cars had ever been farther than this southward. We were indeed embarking on an uncharted ocean, but our Badawin guides, who were by no means familiar with motor cars, had no doubt we would get through. And they proved to be perfectly right. Before we turned back we had reached the shores of the southern sea, and I at least had accomplished a feat which, as far as we know, had never before been accomplished by any human being. I had at the time however no means of knowing how far we could go. The physical difficulties in our way were obviously great. There was for instance the western part of the Rub' al Khali lying, as I supposed, right across my route. That might prove an insuperable obstacle to the passage of the two cars.

So as far as I could gather locally the journey I contemplated was feasible enough barring the break-down of the cars for any reason. My first objective was therefore the crossing of the Rub' al Khali. Beyond that lay Shabwa. Besides Shabwa I heard rumours at Najran of an ancient city that had only recently been uncovered by the movement of the sands which had hitherto concealed it from human eyes. This site was reported to be in the lower reaches of Wadi Markha, and thither I also planned to go if I could. From Shabwa also I would obviously have to go to Hadhramaut to get stores and petrol for the return journey. In fact our petrol supply barely lasted out the distance, and one of the cars had to do the journey from Shabwa to Hadhramaut on paraffin, of which we got a supply from the villages of Wadi 'Arma. Once in Hadhramaut it would have been a pity not to go on to the coast; so I decided to pay a visit to Shihr and Mukalla—if only for the empty satisfaction of establishing a record.

So my programme was complete. The Governor of Najran, Ibrahim an Nashmi, who would be a famous man if he lived in an atmosphere of greater publicity, did all he could—and a good deal more—to help me. We kept up the polite fiction that I was off on an oryx-shooting expedition in the Rub' al Khali. Shabwa had to be mentioned as a fixed limit for the camels, but nobody knew where Shabwa was. In point of fact it is more than 30 miles south of

the position shown in our maps, but it might have been 30 or even 50 miles north of it. And perhaps we might never reach it. Neither Ibn Sa'ud nor any of his officials gave me authority to go to Shabwa: I merely had the King's blessing to go wherever it should please God to take me. And I took the precaution of having my telegram to the King sent off after my actual departure from Najran. In it I informed him that I had started off in search of oryx in the Rub' al Khali. My next telegram to him was to announce my arrival at Mukalla, to which he replied, "God be praised that you are safe."

My projected journey was of course the talk of the town in Najran. Messengers, unknown to me, went forth east and south to spread the glad tidings of our coming with suitable embellishments as to the size and equipment of my party. When all was ready we concentrated at the well of Khadhra at the bottom of the Najran valley. Beyond us eastwards extended the vast sands of the Rub' al Khali. We were to skirt along its edge close to the barrier of hills which form the eastern frontier of the Yaman. It is astonishing what a motor car can do. No cars had ever visited this country before, but we proceeded easily enough—now over sand tracts, now along rocky mountain valleys —for about a week till we came to the wells of Shudhaif to the north-east of the important oasis of Jauf. From here we were to strike across the Rub' al Khali to the wells of 'Abr north of Hadhramaut. The distance was only 150 miles, but we had to reckon it by camel marches. We accordingly arrived on the fifth day, our camels pretty well exhausted as it was August and the sun is none too cool in those parts at that time. Otherwise the going was easy enough over a vast plain of grit and gravel. In some ways this was disappointing. By rights the Rub' al Khali should have been there, but it wasn't. The southern limit of the Empty Quarter in this region lies roughly along the 17th parallel of latitude, and that was at any rate a geographical discovery of some importance.

The plain we traversed was broken up in parts by low ranges of hills. In one of them, Raiyan, we came to an ancient long-buried well called Mushainiqa. Here we found a small party of shepherds with a large flock of sheep. They had been there for over two months. The men drank the sheeps' milk and occasionally got moisture out of the wet mud in hidden crannies in the rocks. The sheep could go without water indefinitely if they were kept away from it—but only the white sheep. Black sheep require frequent watering, and so do the white sheep if they get a taste of water. This well is known to have had water in 1864, when a pilgrim caravan going from Hadhramaut to Mecca watered here. It was an ancient well, as is shown by the graffiti scratched on the rocks, but it had been reopened by a party sent by Ibn Sa'ud's grandfather, Faisal, to mark out a pilgrim route with cairns. In those days all this country was under his rule and the cairns still exist to prove his activities. The track, so marked to this day, is called Darb al Amir to commemorate the Dahmi shaikh who pioneered it. At 'Abr, its terminus, one can still see traces of the little fort built and garrisoned by Faisal's troops to command the wells and to keep the Sai'ar tribe in order. Half of this tribe is definitely under Ibn Sa'ud's jurisdiction, living in the neighbourhood of Najran. The other half, which we met now at 'Abr, is independent. They received us with much good will. To get to Shabwa

from here we had to cross a 30-mile-wide belt of heavy sand dunes. We were caught by a terrific sandstorm in the midst of it. Scarcely seeing where we went, I drove into a deep sand drift, and there we spent about as miserable a night as I have ever experienced. Next day we got clear and duly arrived at Shabwa. As I drove towards the whitewashed tomb of Muhammad ibn Buraik, the patron saint of Shabwa, I must confess I felt a little nervous at the sight of a large gathering of armed men waiting to receive us. There could be no turning back now. I drove up to them and got out of the car. I went forward to shake hands with an important-looking personage, who turned out to be the chief of the Karab tribe which owns the Shabwa salt-mines and the ruins of the ancient city. He pushed me back to my own party and told us to line up opposite the guard of honour consisting of the whole male population of the place. I felt as if we were lining up in front of a firing squad, but suddenly the guard of honour turned right, wheeled left, and passed along our front inspecting us. Each man shook each one of us by the hand and kissed the intervening air, and thus we were admitted to the freedom of Shabwa. It struck me as a rather attractive variation of the guard of honour business.

A few minutes later four sheep were brought to us as a present from the village, while fuel and water arrived just as our camel party came in. A large audience gathered round me as I set the radio going, and listened astonished to the Arabic version of the news. At midnight my thermometer registered 88° and the sky was heavily overcast. The minimum temperature of the night was 84° and the maximum during our four days' sojourn at Shabwa was 102°. The altitude here is about 3000 feet above the sea or a little more.

From about 5 a.m. next morning visitors from the village began to arrive in ever-growing numbers. On our arrival the previous evening I had felt instinctively that Shabwa would prove disappointing. Now by the light of day I was able to take stock of the immediate surroundings of our camp and they were dull enough. Eastward, extending in a long north–south line and at a distance of a few miles, ran the Hawaq escarpment with its echeloned headlands. On the other side of our camp ran the eastern flank of the Shabwa ridge, extending about a mile to south and north. On the low col of the ridge stood the conspicuous white-domed tomb of Muhammad ibn Buraik, the local patron saint. To its left, southward, the wretched little village of Hajar, comprising some twenty-five or thirty houses of clay and masonry, covered a hump of the ridge. On the right, close by, was a small knoll surmounted by a low stone breastwork.

Having dallied a reasonable time and entertained my visitors with tea and coffee as we talked of Shabwa and its surroundings, I suggested that it was time to begin our visit to the ruins. We strolled up to the breastwork. The whole ruin-field lay before us, disappointingly small and insignificant. To the south-west a third shrine, the white-domed tomb of Ibn Yusuf, the successor of Muhammad ibn Buraik, lay about half a mile distant, with the village of Maiwan extending northward from it along the left bank of Wadi Ma'shar. Between Maiwan and Hajar lay the ruins covering a short ridge and its downward slope towards the two salt-mines. On the ridge a collection of stone hovels, partly built of ancient materials, constituted the

hamlet of Mathna, the third of the component elements of modern Shabwa. Not a single ancient building stood intact, not a pillar of the sixty temples erect. The ancient capital of the Himyarites was just a jumble of fallen debris. I could only hope that a more detailed examination of the ruins would disclose something of interest, and in that hope I proceeded down the slope towards the edge of the ruin-field.

We entered the ruins by the fallen remains of a gate in the north-eastern wall, which was only recognizable as a line of earth-covered debris. Whether they expected to see me spirit the hidden hoards of gold and precious stones out of the vaults of the city I know not, but the crowd swarmed about me to such an extent that I could scarcely move. If I picked up a shell or bead or broken bangle or fragment of pottery, they hedged me round with a breathless circle, perhaps thinking that the insignificant object of my attention would transmute itself into a golden sovereign. If I stopped to look at a surviving course of ancient masonry forming part of their modern hovels of loose piled stones they suspected that I had divined the presence of treasure below. And so it went on, while some of them threw themselves with praiseworthy zeal into the sport of collecting the sort of stuff they had seen me pick up and pocket. The huge concourse went forward with me, raking the surface as it went, and every minute or so one of them would bring me a handful of stuff to examine. Some of it was just rubbish to be rejected, some was the usual litter of sherds, bangles, etc., which I consigned to my pockets, while the donors made mental notes of the claims to be presented in due course.

I went up the slope from the eastern gate, past a modern mosque built up on ancient foundations of well-trimmed limestone blocks, to the main ridge, which I had provisionally marked down as the citadel area. Here as elsewhere there was not a single building standing as it stood of old. A great mass of fragmentary houses, a few courses of undisturbed masonry, covered the eastern part of the summit, along whose northern side, from the mosque westward, ran a long straight road, reaching to the farthest extremity of the ridge at a comparatively modern fort dominating the wells in the Ma'shar valley below and the approach to Shabwa from west and south. Following this high-level road, which gave me a complete view of the ruin-field stretching down the slope of the ridge and from its foot northward, we came about halfway to Shabwa's greatest monument, which, for want of a better description, I provisionally christened the Temple of Astarte.

There is little enough left of its ruins, but just enough perhaps to give one an idea of what the temple may have been in the days when Shabwa was a capital city of the Himyarites. The roadway must have passed through the porch of the temple, whose main wall lines it on the south side, while opposite it along the north side lie four square column bases of limestone. The space between the first two pillar-bases (at the east end) is filled in with steps, while there are vague signs of similar steps between the central pair. The same may well have been the case with the westerly pair, but no sign of the steps has survived in this case. Finally, in alignment with the northern edge of the column bases, about 6 feet to eastward of them and projecting forward from the line, is a massive block of limestone 6 feet wide and 10 feet long, forming apparently a ramp—there must have been a smiliar block on the other side—

Shabwa: village of Hajar

Ancient palace walls in Hajar

Shabwa: looking east from the citadel

Shabwa: ruins of a building near the west wall

Shabwa: bases of the temple columns

at the head of a broad stairway leading down the slope to the southern end of the main street of the city. This staircase, of which nothing now remains, must have been about 34 feet wide with a drop of about 50 feet to the head of the street. Two large rectangular markings on the upper surface of the ramp suggested very strongly that there may have been a colossal statue or other massive decoration on each of the ramps, flanking the line of columns to form an imposing approach to the temple.

On the other side of the roadway, which is 7½ feet wide between the inside edge of the pillar bases and the wall, three courses of well-trimmed but not large masonry blocks of the northern temple wall survive for a length of about 55 feet, overlapping the pillars and ramps on both sides. In a position roughly opposite the centre of the line of columns is the actual entrance to the temple by a stairway piercing the wall. The east and west walls of the temple presumably ran from the extremities of the north wall up the slope to its summit, which is about 20 feet above the roadway level. No trace of either wall however survives nor of the internal masonry of the temple, whose floor is visible to the bed-rock with only a thin covering of earth and stones. Of the back wall of the temple, which presumably fringed the summit of the ridge facing southwards, nothing remains but some large blocks of coarse masonry scattered about the top of the southward slope. The rest of the wall has presumably plunged long since into the wadi below.

Such is the great temple of Astarte as it is to-day. I cannot doubt that it was the most important building of Shabwa, dominating the whole city and impressing the visitors who, on entering by the main gate in the north-west wall, would look straight up the main street to the great stairway leading up to the pillared entrance, flanked on either side by imposing statues or pylons. Beyond them rose the main temple building, running up to the sky-line of the ridge with the holy of holies and its ancillary chambers on the flat platform of the summit.

The city area is an almost perfect rectangle with a superficial area of about 27 acres. Its long axis lies south-west–north-east, and it is bounded on the south-east and south-west sides by the Ma'shar wadi. The other two sides face towards a semi-circle of low stony hills, forming an enclosing ridge flanked by the Mihbadh wadi. Shabwa and the ridge form an "island" between the two channels. Northward of the ancient city in the inner angle of the ridge lie the two salt mines, which form the chief or only economic asset of the locality, with a third mine, no longer worked, in a fold of the temple ridge a little way to the west of the temple itself. A ravine running down through it from the ridge has helped to bury the ruins of the city under a crust of saline earth.

The modern village of Hajar, a miserable hamlet of about twenty-five or thirty houses, occupies the site of the old palace, a good deal of whose trim masonry remains *in situ* to form part of the hovels which have been constructed by the descendants of Muhammad ibn Buraik. There are indeed more imposing fragments of the ancient buildings on this site than in any part of the main city, and the masonry is of the same style as that of Astarte's temple.

The history of the saintly house of Shabwa is a little obscure. Buraik, the

eponymous ancestor of the Buraiki clan, was the father of Muhammad, the patron saint, who may well have been the first settler on the ruins of Shabwa. The clan certainly at one time enjoyed a spell of temporal power, and the important seaport of Shihr was held by a member of it before the short-lived Kathiri occupation, which collapsed under the first impact of the Qa'aiti drive. The ancestors of Buraik are said to have been of Sharifian origin. The Karab tribe claims a secular link with the non-Sharifian folk of Ranya, though it is difficult to doubt that their name is identical with the Cerbani whom Pliny mentions as settled in Hadhramaut in his time. The houses of Hajar, I feel convinced, occupy the site of what was once a royal palace. Its periphery on the western side must have abutted on the corridor giving access to the old city. I have already mentioned the main gate in the centre of the north-west wall, giving access to the principal thoroughfare to the foot of the staircase. Just inside this gate on either side of the street are two important-looking buildings. The one on the west side is less well preserved than the other, but appears from the litter of marble fragments amidst its rubble to have been a structure of considerable merit, possibly a temple or town hall. The other is the best-preserved building in the whole ruin-field, but it is of rather coarse massive limestone masonry. It may have been a guard-house or customs office. Its walls on all four sides are intact, but I was unable to find any entrance except a hole in the wall probably made by modern robbers. Besides these a few other ruined structures are vaguely traceable in the area to eastward of the main street. On the other side, where the ravine comes down through the salt strata on to the lower level, the ruinous state of the city defies analysis. Farther west however, in the neighbourhood of the wall of massive masonry that flanks the torrent-bed, there are some interesting fragments of foundations and walls. Not more than three courses of the river wall survive, while, except for the segment at the north-west corner, the northern wall is only traceable by its long silt-covered mound. The same is true of the east wall, of which a few fragments lie uncovered.

Such is the ancient city of Shabwa. Until the spade reveals the treasures buried under its silt-covered debris, the details of its history and lay-out must remain a matter of conjecture. Something at least is now known of the materials used by its architects and of the general character and arrangement of its main buildings. Something is known of the design of its chief temple. But it was disappointing to find not a single building undamaged, not a single inscription *in situ*. Pliny's account of Shabwa (if his Sabota is to be identified with these ruins) is grossly inaccurate. As for the number of its temples, there never could have been sixty nor even six within the exiguous space enclosed by the city walls. One outstanding temple of supreme magnificence it certainly had, and two other ruin heaps within the walls may some day also prove to be temples. But three is a very different matter from sixty, and, even if we take in the suburb on the east side of the city, it is very improbable that it had more than two or at most three places of worship. We may be wrong in identifying Sabota with Shabwa, and I am inclined to think we are. The great sand-belt extending from the inner edge of the Yaman highlands to the gate of Hadhramaut is known to this day as Ramlat Sabatain (the two Shebas), a name which in classical Arabic would appear as Sabatani or simply Sabata.

It is difficult to think that these sands, which to-day cover the courses of the great Sheban valleys, conceal no ruins of the Sheban or Himyarite kingdom. I am inclined therefore to think that Pliny was referring not to the single city of Shabwa but to the whole district of the "two Shebas," which may well have boasted sixty temples in the heyday of its ancient prosperity.

It is an interesting fact that there is a whole series of salt mines, lying roughly from west to east, extending from near Baihan and Marib to beyond Shabwa. Each of them is located in an isolated "island" of low hills, similar to those of Shabwa, at a little distance eastward of the plateau escarpment, whose strata of limestone overlying a base of sandstone are quite horizontal and appear to have remained undisturbed by whatever movement took place along their front.

The best surviving fragment of the city walls we found at the north-west corner, close to the Ibn Yusuf shrine. About a dozen courses of the original masonry rise to a height of 10 feet at this corner, which was probably a bastion. The upper part has disappeared but has been replaced by a clay building of two storeys. One day I went for a stroll over a vast tract which had once been the scene of extensive irrigation. This tract, known as Jidfar al 'Aqm, evidently formed in ancient times the most important part of the vast irrigable region forming the Shabwa basin. First we came to a set of four masonry groups which evidently formed the head of a canal with a main channel and three branches going in different directions from it. The sides of the distributaries were slotted to hold sluices, which must have been raised or lowered (evidently by hand) according as water was wanted in one channel or another. The remains of these channels did not extend very far, but the central canal could be traced for a considerable distance running about north-west. Along its course lay remnants of masonry cuts, slotted for sluices like the others; and we came after some time to extensive ruins of clay dwellings and occasional masonry buildings.

The next morning I visited the salt mine of Milh Mughaira. The mine itself is a cavity extending to a depth of 30 feet, with a superficial area of about 50 feet each way. The rock strata lying above the salt and under the silt covering the ridge are almost vertical and somewhat contorted. They were of black colouring, suggesting oil or bitumen, rather flaky and soft. I descended into the mine by a steep slope from the opening. The salt wall is streaked with the mark of picks. Holes are bored in the salt to receive sticks of dynamite, whose explosion loosens a considerable mass of the rock. The workmen then dig the stuff out with their picks and gather it into heaps for filling into skin bags to be transported to Hadhramaut and even to Najran.

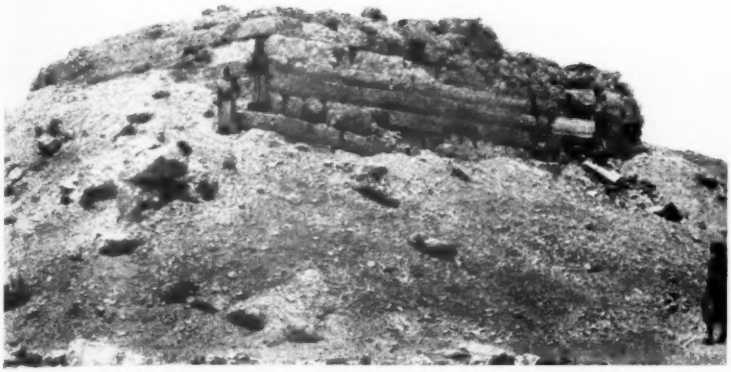
Our route from Shabwa to Hadhramaut lay through the territory of the Karab and Nahd tribes, both of which are independent and recognize no overlord. On one side of us lay the broad sand barrier which we had crossed on the way from 'Abr; and on the other the high escarpment of the limestone cliffs of the Hawaq plateau inhabited by another independent tribe, the Bal 'Ubaid. At intervals along this cliff huge headlands stand out into the valley; under one of them we camped at the deep well of 'Asakir, which is named after the troops of Faisal ibn Sa'ud, who were put on fatigue to open up an ancient buried shaft. So at intervals we had suggestive reminders that effective

Wahhabi rule extended in those days right down to the head of the Hadhramaut valley.

On the fourth day out from Shabwa we reached the first village of the valley, Qa'udha by name. This and the neighbouring villages belong to various sections of the Nahd tribe, who do not recognize the authority of the two Hadhramaut Sultans, though the village of Hainan in the middle of this Nahd tract belongs to the Qa'aiti Sultan, who also frequently tries to act as peacemaker between the constantly warring sections of the unruly Nahd tribe. It was indeed at Qa'udha that, for the first time in my long journey from the Mediterranean, I heard the crack of rifles. We were being entertained to lunch by the local Shaikh when a fusillade of musketry suddenly broke out. I asked what it was all about. "Oh, nothing!" replied my host. "That village over the way is at war with us, and we fire at each other whenever our snipers see anybody to fire at." It seemed a cheerful sort of existence, but the village which we passed a little way beyond Hainan was in a worse way still. It is divided against itself and the two sections are only 100 yards apart. No one dares to leave either section by day, and it is only at night that their inhabitants can get an airing. During my short stay in Hadhramaut two women were shot dead in this village. They had gone out by night to gather firewood but were a little belated in getting back. In the dim light of the dawn they were seen by the snipers of the other section and killed.

Of my further experiences in the Hadhramaut tract I do not propose to speak on this occasion, beyond expressing my deepest gratitude to those who entertained me with the lavish hospitality for which they are justly famed. The Qa'aiti Sultan of Shibam, the Kathiri Sultans of Saiwun and Tarim, the La'jam family of Shibam, the great Kaf Saiyids of Tarim, and finally the Qa'aiti Sultan of Mukalla, who was in England this year as a Coronation guest—all of them overwhelmed me with hospitality, which can never be repaid except with words of gratitude. Hospitality is a commonplace of Arabian life throughout the peninsula, but nowhere in all Arabia have I seen such hospitality as is the rule in Hadhramaut. I will only quote a single specimen. I had a journey of 15 miles or so to do between breakfast and lunch, between Saiwun and Shibam, and my host Saiyid Abu Bakr, of the Kaf family, suggested that a tin of biscuits would obviate any risk of starvation on the way. I demurred but did not press the matter, and it was not till I reached my destination (without needing the biscuits) that I realized that my host had smuggled into my car a hundredweight of tinned foods of various kinds, which lasted me more than a fortnight.

As for geographical work, there was little to be done in an area so well covered by previous European visitors. It seemed to me nevertheless rather astonishing that there was no really reliable map of Hadhramaut until about 1930, when Van der Meulen, the then Dutch Minister at Jidda, and von Wissmann, an Austrian traveller of remarkable qualities, provided one. And it was still more surprising that one bit of geographical work remained for me to do, namely a route-traverse of the motor route between Tarim and the coast at Shihr. It owes its existence entirely to indigenous enterprise, the Kaf family having financed and superintended its construction over by no means easy country.



A building inside the main gate of Shabwa

North-west corner of the old city wall of Shabwa

Shabwa: Husn al Ma

Rock fort of 'Uqla from west

Judaira well

It was pleasant to see the sea again after so many months of desert wandering, but it was pleasanter still to get away from it back into the desert. On my return journey to Shabwa I visited a great deal of the country in the triangle whose extreme points are Hainan, Shabwa, and 'Abr. This tract is the apex of the great reversed delta formed by the many valleys of Sheba, and in it I discovered the interesting and rather puzzling remains of one ancient city, known to the modern Arabs as Bir Hamad. Its extraordinary coarse pottery remains would seem to deserve expert examination, and its excavation will some day add to our knowledge of the buried past of Arabia. Perhaps the new expedition under the leadership of Freya Stark will help in the elucidation of these problems.

There was in Wadi Markha a buried city of the ancients which I wanted to see, and which, according to reports received at Najran, had only recently been revealed by the passage of floods through its sandy grave. So I decided to accept an invitation to visit it, though I could not think of accepting all the invitations I received to visit other places. On the day of our departure from Shabwa for Hadhramaut, Salih the Karab shaikh had come to me, accompanied by an extremely attractive, wild-looking creature, naked to the waist with only a loin-cloth and cartridge-belt below it. His curious drawling speech, exaggerated by a slight impediment, was as attractive as his person. This was Hamad ibn 'Abdullah, chief of the Wadi Jardan tribes. He spoke enthusiastically of the *Kafiriya* (ancient) ruins of his valley, al Bina, a little way beyond 'Aiyad, with al Hajar and Barira above it near the point where the Jardan wadi debouches into the plain. He invited me very cordially to pay his tribe a visit and, as extra inducement, promised to get me a large tin of the famous Jardan honey.

A deputation had also arrived during our absence from the villages of Wadi 'Arma, which is the upper section of the Shabwa valley, extending far up to the watershed and apparently very thickly populated. There are two recognized caravan tracks from Hadhramaut to the 'Arma settlements. The first diverges from the ordinary Shabwa road to run up Wadi Duhr, in which are several very small hamlets, to a pass which descends on the farther side into Wadi 'Arma about midway in its long course. The other follows Wadi Matar from Bir 'Asakir and enters the 'Arma valley lower down. Flight-Lieutenant Rickards, in 1933, travelled up Wadi Matar and descended Wadi 'Arma, thus seeing and recording (on his map, though he appears not to have published any account of his journey, in which to a considerable extent he anticipated my own survey) a large number of villages. He appears not to have attempted to visit Shabwa. His recent death in an aeroplane accident will be widely regretted.

We were in high spirits at the start of our journey to Markha, and the sight of three gazelles was too tempting to resist. The going was good, and the buck, leaving his two ladies to look after themselves, led us a fine chase to the edge of the sands. We plunged into them after him, switchbacking over the transverse dunes or running up the intervening troughs. A soft spot saved him his life, and we remained in it some time trying to dig out the car. At length we got out, returned to the plain and raced over it towards 'Uqla. The whole of this tract, an immense area, must have been under cultivation when Shabwa

was prosperous. We pulled up in a patch of small bushes at the foot of the 'Uqla hill on the southern side. Salih shouted to me that he had found some writings on a little rock whose summit, we had observed on arrival, was crowned by a small building. As I strolled up to the rock to see what he had got hold of, he pointed to it in a casual manner, and I was amazed at what I saw. The rock surface in front of me was covered with inscriptions. I walked round it. Each of the other sides was similarly adorned. We had stumbled accidentally, for Salih had never been there before, on what must surely be the most important epigraphic monument of the Shabwa district.

The 'Uqla rock, roughly square and about 22 feet each way, is of the same dark sandstone which composes the main hill behind it. It formed a plinth 30 feet high, on whose flattened summit stood the ruin. This was a square fort, whose corners were constructed of well-trimmed limestone blocks (evidently brought from some distance), while the central part of each wall consisted of rough untrimmed sandstone slabs and loose stones. About seven courses of the trimmed masonry of the corners survive, coarsely cemented together. The building occupies the greater part of the top of the plinth and is about 10 paces square. It is inaccessible from the ground except by a ruined set of coarse steps on the west side. About half the steps remain, but we had to do some scrambling, with each other's help, to get to the top. The building was evidently a military or police post designed for the protection of the cultivation, which must have extended without a break from Shabwa to here—a distance of 10 miles. At the foot of the rock, by the south-eastern corner and built up against it, is a cemented water-tank about 10 feet square and 5 feet high. It was presumably intended for watering the camels of the garrison, but the water must have been brought from a distance, as we saw no sign of any well in the neighbourhood. After I had spent some hours copying the inscriptions, we made for Qarn Dhabya across the valley beyond the bushy tail of Mudhnib Jafr. Next day, after camping with the Karab tribe, we made our way along the Ansas channel. The going over vegetation and drainage runnels was rather rough, and the bed of Wadi Ansas, though quite narrow, was of soft sand. Just beyond it in a wide bay of the gravel ridge we entered Jirbat al Kafir, of which Salih had talked as an ancient scene of extensive cultivation, and which still has some ruins.

At 4.30 we started off again, crossing the Ghathn wadi and proceeding over a gravel plain traversed by occasional streaks of scrub-dotted drainage, towards the village of 'Aiyad visible ahead. As we approached the line of Wadi Jardan we found ourselves in the midst of a vast area of rather primitive cultivation, with shallow gravel-spread basins surrounded by low dykes to catch the flood water. This strip of cultivation extends about half a mile on each side of the Jardan channel.

The line of Wadi Ansas strictly speaking forms the westward boundary of the Karab, who have however the prescriptive right of *siyara* (providing escorts to travellers and caravans) as far west as Wadi Jardan. Beyond there that right vests in the Hammam, a section of the 'Aulaqi tribe which does not acknowledge the suzerainty of the 'Aulaqi Sultan of Ansab.

Our camel party had already arrived when we reached 'Aiyad about 5.30. In front of the village the whole male population of the place, some forty or

fifty men, had assembled to receive us. As we drove up two shots were fired as a salute. The crowd then formed a long line in front of the cars opposite them. The guard of honour then walked past to inspect us at Shabwa, kissing the air and clasping our hands. 'Aiyad itself is of no great antiquity and Sa'da, also not very old, was the original settlement of the Qaramish tribe; but they must have been in these parts for a considerable time as the salt-mines in the neighbouring ridge of Haid 'Aiyad are their property. The population has three wells, each of 20 fathoms, for its water supply, but only one of them, outside the village towards the wadi, has a perennial supply.

We entered a gloomy hall in which, coming from the bright sunlight outside, I could see nothing. We groped our way blindly up a rough mud stairway to the first floor, where it was less gloomy than below. From there we had to climb up wooden rungs fixed in a corner of the wall to a trapdoor admitting into a room on the second floor, whence similar rungs led to a narrow opening, through which we forced ourselves on to the roof.

It commanded a splendid view, and I took my time noting every feature of the vast countryside. Looking back over the way we had come I could see the Ghalib headland and the hill of 'Uqla, as also Ghabr at the head of Wadi Ansas. To southward the lofty, isolated rock mass of Fakhdh stood out from the Qamra and Naukhan headlands marking the beginnings of Hadhina territory, while between us and these landmarks ran a curious line of volcanic peaks of no great elevation, called Qurun al Sauda and marking the Qaramish limits on that side. Somewhat west of south lay the Kubar and Dhuhair basalt ridges, between which Wadi Hammam issues from the mountains to die out in the plain to our south-west. The ridges divide the independent Hammam from the territory of the 'Aulaqi Sultan and overlook the latter's capital, Ansab, said to be but a mile or so behind them. About south-west stood the rock of Hajar Yahirr, where Wadi Markha bursts out of the mountains to peter out against the sands at a point lying west-north-west of 'Aiyad. Far to the west, dimly through the mist, showed the long rugged escarpment of 'Atfan, pointing the way to Baihan and occupied by the Shalamish, a branch of the notoriously unruly Nisiyin. The 'Aiyad salt-mines lay a few miles off to the north-west.

The one thing I regretted in retrospect was that I did not visit the ruins of Wadi Jardan. For all their factious behaviour and patent avarice, the Ahl Fashr struck me as one of the most charming elements in southern Arabia, an unspoiled relic of the ancient pagans. They are in fact one of the three surviving branches of the Bani Hilal of old, the others being the Ahl Khalifa of Hadhina and the Nisiyin. The Bani Hilal have a great legendary reputation pretty well all over Arabia, and all old buildings of unknown origin are generally attributed to them. In the southern part of the peninsula their legend is peculiarly in vogue in spite of what one might imagine to be the superior claims of the 'Adites, Sabaeans, Himyarites, and others. Abu Zaid al Hilali, their traditional hero, is a familiar name on the lips of men in these parts, whereas the Queen of Sheba and other great personalities of historical times are but blurred memories. Who the Bani Hilal were we cannot yet say, but, if their putative descendants hereabouts are really descended from

them, I could not detect in them any physiognomical or linguistic hint of other than Semitic origin.

The camel party went off after breakfast straight for our destination, the Nisiyin-Hammam camp at Qarn al Fuqaiha in Wadi Markha. The prominent granite peak of Hajar Yahirr indicated the exact position of the camp. I thought it would be a pity to pass so close to Hadhina without seeing something of its settlements, and decided accordingly to proceed in that direction, making for a low volcanic berg called Karsh. Outwardly it appeared as a low barrow about 200 to 250 feet in elevation. On the north side, by which we ascended, there is a wide crack in the lava-stream, full of tumbled blocks of lava and tuff. On reaching the summit however we found a perfect crater, somewhat elliptical in shape and completely surrounded by steep walls averaging 200 feet in height with higher sections at each corner. The pit of the crater appeared as a lake of yellow sand peppered with volcanic dust. In it grew a few small bushes of acacia. The general appearance of the lava and the unbroken character of the crater walls suggested comparatively recent activity, and I collected samples of the lava, etc., for ultimate examination by the experts of the British Museum. This group of craters, with Karsh in the centre, lies in the delta of Hadhina with the limestone escarpment to east and north. Beyond Wadi Markha the limestone escarpment resumes in the 'Aftan massif. It seemed, as I studied the situation from the summit of Karsh, as if an ancient disturbance had broken clean through the limestone plateau, dividing it into two sections, and had left in the gap two parallel ridges, which with the escarpment on either side served to create the three valleys of Hadhina, Hammam, and Markha. At a later date, perhaps quite recently, a second disturbance blocked the Hadhina valley by throwing up the volcanic group of Karsh and its satellites. Far off across the southern horizon stretched the great mountain range of Kaur crowned by the lofty peak of 'Urr. At its feet on the farther side lay the important settlements of Habban and Yashbum with Ansab itself behind and quite close, they said, to the left extremity of Kubar—probably not more than 10 miles from our position.

Ahl Khalifa are, as already noted, a branch of Bani Hilal. They are an independent tribe acknowledging the authority neither of Yashbum nor of Ansab. Their villages extend down the Hadhina valley from its head at Qaima as far as the Naukhan headland. The total adult male population of the valley is probably not much more than 300 or, say, a total population of 1000 souls including women and children.

From Karsh we steered slightly north of west on a little group of volcanic kopjes called Akhasif. In the neighbourhood of Juraiba we encountered and stopped to talk with two men of the Nisiyin on their way from Hadhina to Hajar Yahirr. They couched their camels at a little distance and came towards us on foot. The first man as he approached fired his rifle into the air, holding it aslant across his body. This, I was told, is an established custom among these tribes, to indicate that the person approaching is unloaded, the empty cartridge remaining in the breach. Passing on, we crossed the Hammam drainage issuing from the hills on our left. We then passed through a line of four small rock-mounds which form the territorial boundary between

Hammam and Nisiyin. To the left at no great distance we could see the Markha channel debouching into the wide, sandy, hill-girt plain from between the hills of Khushash and 'Ajaz. The prominent landmark of Hajar Yahirr was now only 3 miles ahead of us, and at 4.30 we drove into the joint Hammam–Nisiyin camp in the valley behind the low ridge of Qarn al Fuqaha, at whose edge our hosts had pitched a tent for us.

As we drove up the Badu drew up in a long line after the usual fashion, and we did the same. Whereupon three men stepped forward in turn and fired a shot into the air. We then entered the tent. The number of people that crowded into that tent was astonishing. Our host was the Hammam Shaikh, Salih ibn 'Abdullah, a well-preserved old man and, indeed, not so very old, though he had travelled with Wyman Bury a generation ago. The Nisiyin contingent occupied the opposite corner on either side of their chief—I think his name was 'Ali—a powerfully built, aggressive, and rather disagreeable greybeard, who looked as if he was more accustomed to brigandage than polite conversation. Whether he was quite sane I could not make out. He certainly had a marked personality, a rough wit of his own, and a directness of approach to the problems troubling his mind, which I fully appreciated, though Salih afterwards apologized for him. He dominated the proceedings and paid me the compliment of addressing himself exclusively to me.

Meanwhile, for the first time, I saw an old biblical custom which is still widely prevalent in southern Arabia from 'Asir to Yaman and Hadhramaut—the anointing of the feet of guests with oil of *Jiljilan* or sesame. A slave or servant approached me, carrying the oil in a small leather pot, but I laughingly declined his attentions. Salih remembered Wyman Bury well enough, but his memory of the details of the "Palmetto Post" affair seemed to have become rather vague with advancing years. The scene of the Karab attack on Bury's party on that occasion was easily visible from our camp. I did not actually visit it, but the dwarf-palm patch is said to exist still in the mouth of Wadi Sa'd issuing into the sands from the near side of the 'Atfan escarpment. It was Salih al Hazaiq's folk, the 'Uwaira Karab, who carried out the attack, but Salih himself remembered nothing of the incident. He was obviously little more than a child at the time.

The one matter that loomed large in the councils of the Nisiyin, as also of the Hammam and other tribal elements in these parts, was the pilgrimage. Under present conditions the Hadhrami pilgrimage, whether by sea or land, and the Yamani '*Usba* or pilgrim caravan, are regarded in the Hijaz as foreign visitations. They have accordingly to pay the usual pilgrim dues, from which of course the subjects of Ibn Sa'ud are exempt. Next morning I devoted myself to a thorough examination of the valley in which we were encamped. It was of this spot that we had heard at Najran rumours of recently uncovered vestiges of antiquity. It certainly looked very interesting and puzzling. Wadi Markha, as already noted, debouches from the hills between the peaks of Khushash and 'Ajaz. It seems possible that the narrows at this spot—perhaps 200 or 300 yards wide—were dammed to impound the flood-water. At any rate from that point downwards a number of walls radiate fan-wise across the delta. The local folk believe these walls to be the remnants of ancient forts and palaces. Apart from a small, comparatively modern

watch-tower on a low ridge a few miles away to south-east of our camp I could detect no sign of anything that could be called a house. The walls, well though rather roughly constructed of blocks of the local stone, mostly sandstone and basalt, of various sizes, were broken down in parts and sanded over. They appeared also to vary considerably in length, and the space enclosed between each pair varied very much in width. From the dam (if there was one, which seems fairly certain) to our camp position the distance was rather less than 3 miles, while the walls could be traced a further mile or $1\frac{1}{2}$ miles to a low sandy barrier overgrown with *rak* bushes, forming the right bank of the natural channel of the wadi. I concluded therefore that the walls served merely to divide up the cultivable area into convenient strips, into each of which the water must have been admitted in turn through the sluices in the dam. The total area brought under cultivation at any time must have depended on the amount of water impounded by the dam, but it must have been very substantial as there was practically no limit downstream to the ever-broadening cultivable strips. I had no personal experience of such a system of irrigation, but the conclusions I arrived at seemed irresistible. Since my return from this journey I have been fortunate enough to find support for them in a detailed account of the irrigation works at Marib recently published by an energetic Syrian explorer, named Nazih Mu'aiyad al 'Adhm. He gives the number of diverging rays in the irrigated area of Marib as twenty-two. The two systems must clearly have been the same, and it is likely that a similar system was in vogue at Shabwa also. It is neither canal-irrigation nor basin-irrigation, but a kind of controlled and directed flooding.

At noon next day we started off, steering east-north-east at first over the sandy traces of the old irrigation and then over the vast spill-plain of the Hammam wadi. A run of 12 miles brought us to some low bushes marking the dead tail of the wadi, which struggles on from here for a few miles in a north-north-east direction, its channel a scarcely perceptible depression covered with rough scrub. The tail of Wadi Markha, marked by a small patch of acacia bushes, was duly reached. We could clearly see Hajar Yahirr, our starting point, about 30 miles away a little west of south.

We now made almost due north for the edge of the Ramla and, as we approached it, came upon a large herd of camels pasturing on the new herbage growing along the edge of the sands. We gave them a wide berth as we could not ascertain the identity of the herdsmen, and eventually reached the sand-belt in the neighbourhood of some highish dunes called Abu Janb, past which a caravan track from Shabwa runs to Harib. After some miles of excellent going the plain became rather rougher as we approached the tail of Wadi Jardan. Its channel was marked by a wide band of moribund acacias rising out of huge divots of sand. We had now done 75 miles since leaving the Nisiyin camp and were glad to camp for the night. Since the equinox autumn conditions had definitely established themselves. The nights were crisp and cold and in the early mornings visibility was astonishingly good. At 11 p.m. the temperature was 66°, while during the night it fell as low as 57°. But the place was dead. Not an insect came to my light during the night, and the only birds we saw were a bifasciated lark and a red-tailed shrike, the latter a visitor from afar.

I had planned to follow the Jardan down to its not distant grave at the edge of the sands near the small twin hillocks of Qarnain. We halted by the first hillock, a 30-foot mound of out-cropping metamorphic sandstone covering an area of several acres, with a few small acacias and other hardy shrubs growing on and around it. The summit gave me a wonderful view of the surrounding country from the 'Atfan scarp on the south-west as far as Khashm Rumaid on the north-east, while far off in the sands to the north-west the black ridge of Aryam marked the direction of the track we should be following the next day on the way to the land of Sheba. The Qarnain rocks stood out like little islets in a sea of sand, and seemed to have an astonishing attraction for migrant birds, of which there was quite a colony in occupation. A juvenile cuckoo was the chief prize. A rock thrush was another of our victims, while the bag also included a wheatear and two species of whitethroat. In contrast to the Qarnain rocks the birds in the Ansas valley were all residents—the sunbird and the bee-eater, bulbuls and blackstarts, a few ravens, and a single hoopoe.

Soon after 3 p.m. we reached and settled down in Salih's camp. Muhammad, the chauffeur, drove into Shabwa to warn the rest of our party to rendezvous by the following evening at 'Arain, where we proposed to spend the first night of the desert crossing. The car returned soon after dusk, reporting that all was well. Salih, who had decided to accompany me to Mecca and who had been busy since dawn making final arrangements for the comfort of his family during his long absence, showed no sign of being ready. I felt that we should never start if we waited on him. So, leaving the second car to bring him along, I drove off. It soon reached us and Salih jumped out. "Look at me," he cried; "I had trouble to get away." His *aba* was indeed rent in many places. They had almost held him back by force. His aged mother had led the assault, forbidding his journey and clinging to him, weeping bitterly. He was still panting from the struggle, but proud of his victory.

Our course, pushed somewhat eastward by the protruding tongues of the Ramla, reached the Ma'shar delta near the point where we had enjoyed a mid-day rest on the outward journey. For some miles now we were on our old route through the Shuqaiqat corridor between the main sands to our right and a southward extension of them towards 'Uqla. 'Arain was close at hand in a north-westerly direction across a tract of sand and dunes through which, in due course, we found quite an easy passage. The troughs between the dunes, some of the latter rising to knife-edge summits, were dotted with desert vegetation. Frequently we encountered, in patches, the ancient river-bed exposed in the midst of the sands. On the caked soil of such spots shells and flint flakes were numerous.

So, after a run of some 20 miles from the delta tract, we came to 'Arain, a longish ridge of metamorphic sandstone standing some 150 or 200 feet above the general level of the sands and evidently representing the surviving remnants of a longer ridge, on whose weather-smoothed surfaces the travellers and Badawin of yore have left their records in Thamudic characters. I copied these before climbing the ridge in search of birds. The axes of the dunes around us seemed to be fairly regular in a west-north-west to east-south-east direction. Their height was rather dwarfed by the greater elevation of our

viewpoint, but the falling sun threw them into relief with shadows. Afar off in a west-north-west direction we could see the higher features of the Thaniya ridge, where we were to spend the following night. Behind us Ghalib and 'Uqla and the two Nasrs outlined the Shabwa tract, while the Rumaid headlands could also be just seen in the distance.

Up to this point we had experienced but little difficulty in negotiating the sand tract, through which a sort of natural corridor, only occasionally blocked by cross bands of sand, had led us to our destination. Beyond 'Arain however it was all sand, an ocean of sand—sand in vast unruffled sheets, sand in wave-like ridges, sand in muddled groups of moraine-like hummocks. Here and there we encountered light patches of shingle and exposed sections of the old river-bed. With amazing assurance Salih piloted me towards a low col dividing the otherwise formidable barrier of the Abtar dunes, which appear to extend a vast distance to east and west.

In due course the downs degenerated into a series of high, impracticable sand-masses linked together by basins of firm soil sprinkled with shingle and fragments of flint and obsidian—relics of human industry doubtless washed down to these parts by ancient floods. It was sometimes a matter of difficulty to negotiate the steep sand-slopes leading down to these bottoms. On one occasion I had got down safely and was exploring the shingle for flints when Muhammad, taking a slight shelf of the slope too carelessly, stalled his car with a nasty jar. The back axle had broken. The car was doomed. It trailed down the slope heavily like a bird with a broken wing. A silence of utter gloom settled on us. And the decision to abandon the broken car was never actually formulated in words. Taking three of the party with me I drove away from the scene of the disaster, after instructing the rest to unload and strip the dead car against the return of mine to their rescue. While they waited they marked the derelict vehicle with the *Wasm* of Ibn Sa'ud and built up a cairn in its honour, surmounted by one white and one black stone. And some day doubtless car and cairn will share a sandy grave as the whirling atoms of the desert gather round them to shape a dune.

Thoroughly depressed by this unexpected disaster, we drove on over the wilderness of billowing sand for some 6 or 7 miles, when we emerged on a wide valley bottom of shingle and light gravel bounded on the farther side by an extensive tract of basalt kopjes, of a dark reddish-brown colouring. These rocks, rising little more than 50 feet above the level of the plain, are known as Afalil. On the farther side of the rocky tract, on the line of our route through it, my attention was attracted by a curious grouping of great basalt boulders, very suggestive of a primitive sun-temple. The rocks form a circle of some size with a central aisle, lined with boulders, leading up to a large "altar stone" at the western end. This feature, together with the orientation of the aisle and the circular periphery, certainly seemed to betray the handiwork of man, but I was not able to convince myself that it could not equally well have been a freak of nature.

A little before 5 p.m. we drove into the Thaniya strait, and selected for our camp a pleasant spot in its midst with some large *sarh* trees and numerous acacia bushes. Having unloaded everything from the car I despatched Muhammad and Salih with it to the rescue of the marooned party.

The Arabs recognize the Thaniya gap, a quarter of a mile wide and about a mile long, as the channel of the great Sheba Wadi—Wadi 'Abida or Wadi Abrad as they call it. The profusion of fresh-water shells and other flotsam proved the point beyond doubt, and it was only a matter for wonder that the ancient river should have carved its channel through this mountainous barrier instead of circumventing its southern extremity, but a few miles distant and protected only by the massed sands. Westward across a wide sandy plain lies the similar range of Ruwaik, beyond whose northern flank, far off to the north-west, I could see the peaks of Raiyan, among which we had camped on our outward journey two months before. I now had no doubt that I had established the connection between the Hadhramaut Wadi and its sources in the Yaman mountains. The chief of those strands was Saba, the great valley of Sheba, descending from Sirwah to Marib. Its tributaries were Jauf and Raghwan from the north; Juba, Harib, and Baihan from the south. In days of yore their united streams swept across the plain, harnessed to the needs of man and supporting a great empire whose fragrant merchandise was the envy of the world and the cause of many wars. To the south-west the rocky mounds of Safir, almost obliterated by sand, betrayed the salt mine which yields a modest revenue to the semi-nomad 'Abida folk of the Marib settlements. Between it and the Ruwaik ridge the sands of the valley petered out on a wide gravel plain over which our course would be set.

Beyond the strait the ground was rough and stony on the flattened outer slopes of Thaniya, after which we spun merrily over a light gravel plain. We must have been travelling at 50 miles an hour. Suddenly, after we had done about 5 miles, the car checked, bounded forward and came to a dead stop. Far and wide the gravel plain spread round us invitingly, a chequer-board of darker and lighter hues. For a moment I thought we had struck a patch of soft sand under the gravel covering. The car dug itself deeper into the pit as I attempted to extricate it. We got out to examine the trouble and our Dahmi guide saw at a glance what had happened, though he had had no personal experience of the phenomenon before. We had foundered in a pit, perhaps about 40 or 50 yards in diameter, of extremely fine dust, not sand, but ashes, or rather, I should perhaps say, an ash-coloured powder. I thought at the time that such pits might be the buried vents of volcanoes which had not succeeded in penetrating the earth's crust, and it seemed to me also that they might provide a plausible explanation of the Bahr al Safi stories expanded by medieval imagination into vast tracts of desert quicksand swallowing up anything that ventured to pass over them. One explanation suggested is that the powder may be the degenerate remnants of patches of lignite such as I found in association with the salt domes of Shabwa and its neighbourhood. It is certainly a striking coincidence that the Safir salt mine lay at no great distance from the scene of our check. Tests for bituminous associations have apparently failed to reveal them, and the problem is still being studied by the experts of the British Museum. The latest, and most probable, explanation, suggested by Mr. Game of the Museum, is that these pits are the beds of dry lakes.

The first exciting incident after this was our first sight of oryx tracks, not very fresh; but soon after we came upon fresher indications, where a solitary

bull oryx had spent the night before resuming his travels in a northerly direction. I had noted a small hillock which promised a good view of the country round. It proved more remarkable than I had anticipated, and provided me with a conundrum which puzzled me for the rest of the day until, quite by accident, I stumbled upon an explanation of it which only served to deepen the mystery. The summit of the hillock was roughly flat and circular, but it was with a shock that I realized, at first half incredulously, that this rock had played a part in the life and ceremonial of mankind. Leading up the west side of the hillock from the plain level to the summit was an unmistakable pathway, 3 paces in width, hedged on either side by low walls built up of slabs of red sandstone. Looking about for some plausible explanation of this strange phenomenon, I gradually became aware of something still more astonishing. The summit of the main Ruwaik ridge (about a mile away or more) seemed to be dotted with curious circular turrets reminiscent of the "pill-boxes" of the Great War. My glasses showed me that they must be the handiwork of man, but I could think of no explanation. That the flat summit on which I stood and the walled passage leading up to it had some connection with them I did not doubt. I could imagine no use for it except as a ceremonial "high place" of Sheban religion—and that conjecture can scarcely be far from the truth, though it did not explain the Ruwaik structures —of which there must have been many thousands. I longed to get a nearer view of them, but the car could get no nearer than we were. So on we went westward over the gravel plain. We emerged in due course on a slightly undulating tract flanked by confused ridges, along whose base a wide, shallow channel called Sudaihat carried the drainage of the higher ground into and across the plain to join the central channel, a dark line of bushes now visible about 10 miles away in the sandy wilderness and our first unquestionable sight of the Sheban wadi.

As we approached the angle formed by the two 'Alam ridges, known as the Black and the White, I saw close by on our left hand a sight that thrilled me through and through: a slope dotted with little turrets like those we had seen from afar on the ridges of Ruwaik. Without hesitation I deflected our course towards them. A glance sufficed for a provisional solution of the riddle of Ruwaik. The structures were tombs. The neighbouring hillsides, as far as I could see, were littered with them—thousands upon thousands of them there must have been—in long lines running vertically down the slopes and horizontally along their summits and flanks. I was in the midst of an immense necropolis. Ruwaik was obviously another. But what might be the meaning of these cemeteries on this huge scale so far out in the desert, at least 40 miles from the nearest wells of to-day? The tombs themselves absorbed my whole attention, some five-and-twenty of them on the slope of an outer spur of the 'Alam Abyadh ridge. Circular in shape, beautifully built up of flat slabs of untrimmed local limestone varying from 1 to 4 inches in thickness, they varied greatly in size. The largest of this little group, at the top left-hand corner of the slope, was 10 feet high, 25 feet in diameter, and about 85 feet in circumference. It had evidently been opened in search of treasure by robbers. In no case could I discover any evidence of a human burial. In all cases the tombs seemed to have been opened and rifled of their

Fissure and cliff of Wadi Sib

Rubai'a village

Hadhina delta: volcano of Karsh

Karsh: interior of crater

contents, including every remnant of their occupants. For the time being I had to rest satisfied with this hurried investigation of a small corner of the great necropolis. As I drove along its flank towards camp I observed countless tombs of the same character dotting the slopes over a space more than a mile long.

There was no sign of the baggage folk, and it was whispered that, having all our water supply with them, they had given us the slip deliberately. Some even said that they had been heard the previous night discussing such a project. Our water supply was in the circumstances dangerously low, and I insisted on keeping apart what was needed for the car.

In this neighbourhood, perhaps 5 or 6 miles from our position, the Marib and Jauf channels and their lesser satellites unite to form a single wadi. The twin hills of Khurj, far off, marked the position of Marib itself due south-west of us. Farther to the north, and on the line of our march forward, the headland of Hailan marked the exit of the Raghwan wadi from the shelter of its mountains; while to the west-north-west the mighty massif of Laud with its highest peak, Zuwaira, already seen by me from our camp at Ghumair on the outward journey, towered over the settlements and broad valley of Jauf. For the first time I looked out into the very heart of Sheba, the hub of the old Minaean and Sabaean civilizations of which we know so little.

Next morning I climbed the scarp to resume our investigation of the old tombs, which, as we had seen from camp, dotted the sky-line of the ridge like a string of fortifications. To right and left of us the cemetery seemed to extend beyond the limit of vision. I could only hope to examine a small section of it, and the eastward slope from the summit of the escarpment, on a front of about 300 feet at the top and narrowing as it descended to a small ravine between this ridge and another beyond it, seemed to provide as good a specimen of the necropolis as I was likely to find without too great an expenditure of time. In all, in this small space, I counted some 168 tombs of varying size. Still I could find no trace of a human relic, not a bead nor a bone. And it was not for want of searching, as I collected a large number of Jurassic fossils from the ridge, which thus appears to be a south-westerly extension of the Tuwaiq uplands of Central Arabia.

So, leaving this great problem of the twin necropolis unsolved, we started off across the Sheban plain, making for the Raghwan valley which lies midway between the greater districts of Jauf and Marib. The well selected by my guides was Mas'uda, and there we spent two days recuperating from the waterless desert crossing. I made good use of them. Close by Mas'uda itself lay several ancient sites, Khirbat Sa'ud, Asahil, Fadhaya, Duraib, and others. The first two were large fortified towns, whose walls are still practically intact. Both of them and Duraib provided me with many inscriptions, and none of them appear to have been visited or examined before. It is true that Halévy claimed to have visited Khirbat Sa'ud, but it seems that his guide gave that name to another place. He, like myself, collected many inscriptions from the place so named, but the fact that his inscriptions are not included in mine nor mine in his seems to suggest that we were dealing with different localities. In my Khirbat Sa'ud there is a very attractive temple which lies in ruins, apparently shaken down by an earthquake. The walls are

massive and well built. The interior is full of ruined masonry and sand-covered mounds, while the sand that laps up from the desert to the very walls of the fort appears to cover also the remnants of a large open city or settlement. No doubt a good deal of the old masonry has been removed at various times for various purposes. One nice bit of stone with an inscription was in use as the headstone of a modern grave. My guides kindly removed it under cover of darkness and it is now in the British Museum. Asahil is if anything in a better state of preservation and its walls on all four sides are adorned with large plaques, recording the fortification of the place (apparently Harab was its name, *cf.* modern Harib south of Marib) by one of the Mukarribs of Sheba. At Duraib (Katal of its inscriptions) there are many records of temples built there to various deities, though the place is more broken up than the other two and was not walled. One very fine large fragment of a decorative cornice that I saw doubtless formed part of one of the temples. All these localities lie along the course of Wadi Raghwan, near whose exit from the hills is another large ruin-site called Khirbat Jid'an. Of the actual settlements of Jauf I saw nothing, as it seemed inadvisable to pay a visit when so many officials of the Yaman government might have wondered what I was doing there without a permit.

I did however pay a flying visit to the threshold of the Sheban capital, Marib. It was a rather risky experiment as it had to be done hurriedly and secretly with a single car and only two guides. Telling the rest of the party that we were going off to hunt gazelles we went down about 25 miles southward of Mas'uda. The country was rough, and not interesting until we approached the twin peaks of Khurj, the summit of one of them being the point suggested by my guides for a good view of the Marib valley. The Khurj peaks are but two of a series of about fifteen volcanic cones, which seem to be of recent origin. They all lie on the left bank of the Sheban channel and between them runs a broad black stream of lava like a glacier. This ends round the foot of the most easterly cone close by the bank of the wadi itself, in which are many scattered, but small, settlements of the modern Badawin. The town or village of modern Marib stands on a low hillock and appeared in the distance, as I saw it through my glasses, as a group of buildings occupying the slopes and summit of the hill and forming a fine silhouette against the dull background of the sandy plain beyond. Doubtless the ancient capital occupied a much larger area round the hillock, but it was not possible to make out any of the detail. I should like to have had a nearer view, but in the circumstances that was impossible. Some way above Marib, in a channel known as Wadi Dhana, they pointed out to me the site of the famous dam, but the overlap of the ridges, between which it dams the channel, made an actual sight of it impossible. The Syrian traveller, already mentioned, has published a fairly full account of this locality and, as far as I know, he is the only writer on the subject who has noted the volcanoes in this neighbourhood, though he did not examine them in detail and therefore did not note their fresh appearance. The Khurj cone, not unlike that of Karsh in Wadi Hadhina, contains a perfect crater whose ragged walls, about 200 feet high, completely enclose the lake of sand which covers the floor.

I had at least seen Marib. Many of its inscriptions have of course long

Hillock with walled road at the edge of Ruwaik

Wadi Markha. Ruins of old irrigation dykes

Tombs on Alam 'Abyadh

Raghwan: large altar stone of temple

Asahil: panorama of interior from south wall

been known thanks to the labours of Halévy, Arnaud, and Glaser. I returned to my companions at Mas'uda, and next day we left the Sheba valley, crossing the great Jauf wadi under the massive granite peak of Zuwaira, in the Laud range a little below the Jauf settlements. Our northward journey back to Najran lay rather farther west than our outward track, which we rejoined at the exit of Wadi Khabb from the hills downstream of its group of oases. The Jauf wadi shares a common watershed with Wadi Najran, descending from the high mountains beyond Sa'da. The mountains between its left bank and the desert form the Khabb basin and must be regarded as separate from the main Yaman range.

It only remains for me to close with a very few tentative observations on the significance of what I had seen in the heart of Sheba—the two great necropolises of the desert, the ruined sites of Raghwan, the Marib valley, and finally the volcanoes. The chronology of Sheban history is extremely puzzling and uncertain, but it is generally accepted, I think, that there were three main phases and three different peoples in question. The earliest phase, whenever it may have begun, appears to have ended about 700 B.C., and Mr. Beeston, of Oxford University, to whom I have submitted my inscriptions, thinks that the 'Uqla inscriptions from near Shabwa enable us for the first time to construct a tentative list of the Hadhrami rulers. The second period ends about the first century B.C. and the third somewhere about the fifth century A.D. There are Minaeans, Sabaeans, and Katabanians mentioned among other peoples, the first named centring on Jauf and the second on Marib. The name Minaeans suggests Phoenicians. The desert necropolises, which in view of the Himyaritic inscriptions on similar tombs in the Najran area must date from Himyaritic or earlier times, recall the cemeteries of Bahrain and the Central Arabian provinces, which may well be Phoenician relics. I suggest therefore that we may here in the Sheban country be in contact either with a Phoenician invasion and occupation accounting for one of the three imperial periods, or with the actual original homeland of the Phoenicians, who appear in early history as well developed maritime and commercial communities but have never been tracked down to their source. The Phoenicians are credited with the invention of the alphabet, and I was certainly struck, in many of the rock-inscriptions and pictures I found, with certain signs which seemed half-way houses between pictographs and letters. I do not press this interpretation of the results of my journey. I merely suggest it for the consideration of the experts.

I have another suggestion to make, regarding the volcanoes. It is probably impossible to date them within a few thousand years, but those who have seen the material from them cannot say definitely that they cannot be quite recent. We have three groups of them, each more or less closely associated with a former scene of great civilization and culture which was destroyed by some agency unknown. At the same time we cannot be expected to swallow the legend of the rat which bored a hole through the great dam of Marib, causing its collapse and the overwhelming of the great city by the impounded waters. Desiccation alone is not an adequate explanation of the catastrophe, though desiccation may well have followed in the train of the abandonment of the agricultural activities of the Shebans. Is it not therefore possible that

the eruption of volcanoes accompanied by earthquakes may have shaken Sheba to its foundations and overwhelmed it with ruin? The fallen temples in the Raghwan area and at Shabwa suggest the possibility of such an explanation, which again I offer very tentatively for further study by the experts.

And assuming for a moment this explanation, I return for a last dig at the desert necropolises. If the Sheban people fled from their shaken mountains they must have fled into the desert. In such circumstances they may have perished there in immense numbers and been consigned to these myriads of graves, obviously graded in size to suit the age and importance of the folk to be buried. Only the apparently complete absence of human relics operates against this theory. But, if that fails, what is left? Pliny tells us that the Shebans paid but scant courtesy to their dead and cast their corpses out on the urban rubbish heaps. Is it possible that they compensated such discourtesy by erecting these memorials far away in the desert to house the lost souls of their departed? Is it possible that these tombs were cenotaphs, associated with their ancient religious ceremonies? This again is a question that cannot yet be answered, but I think I can claim that my journey to Sheba has raised a number of problems, which the spade may one day help to solve and which are in any case the business of expert archaeologists rather than of common explorers.

DISCUSSION

Before the paper the PRESIDENT (Professor HENRY BALFOUR) said: Every other year a special lecture is given to the Society under the Dickson Trust—the "Asia Lecture," which describes its own objective sufficiently well. This year we have been fortunate enough to secure Mr. Philby to give it, and that, I am sure, will give you all great pleasure, because nobody has done more to throw light on the Near East than he has.

As you all know, he is one of the Society's Gold Medallists and has made a great name for himself both as an explorer and as an archaeologist; and, I may add, also as a zoologist. He is a very versatile man and probably has a great deal to say to us this evening, which will certainly not permit of my intervening. It is with pleasure that I now, on your behalf, ask Mr. Philby to give the Asia Lecture.

Mr. Philby then gave a summary of the paper printed above, and a discussion followed.

The PRESIDENT: We are honoured to-night by the presence of H.E. the Sa'udi-Arabian Minister, and I ask him to be kind enough to address us.

H.E. The SA'UDI-ARABIAN MINISTER: It has given me much pleasure to be here this evening to listen to the lecture by my friend Mr. Philby, whom by right of his many expeditions we might correctly term the "geographical encyclopaedia." As an Arab I feel pleased to see that the people of this country are showing more interest in Arabia, especially in regard to the study and better understanding of Arabia's hitherto unknown periods of history prior to Islam.

Fourteen years ago Mr. Philby's only ambition was to penetrate the Rub' al Khali. That feat he accomplished seven years ago. Last year he penetrated Arabia from the north to the south, an area which is no less important than that on the other side of the peninsula. Is Mr. Philby now satisfied with his travels in Arabia? Will he not try again? I do not doubt that his answer will be in the

affirmative, because travel is similar to drug-taking: it is a habit of which it is not easy to rid oneself.

I would like to take this opportunity to express my thanks and gratitude to all scientists and travellers who work for the sake of science and the clarifying of the unknown periods of history. At the same time I thank the Royal Geographical Society for giving me the opportunity of listening to Mr. Philby's lecture. Lastly, I wish to express to Mr. Philby my heartiest congratulations on his successful journey.

The PRESIDENT: Perhaps Mr. Beeston would be good enough to say something with regard to the inscriptions, which are very important discoveries.

Mr. A. F. L. BEESTON: I am afraid I must begin by disappointing you, because it has to be confessed that there is not in any of the inscriptions mention of a Queen of Sheba. There is one mention outside the Bible of a Queen of South Arabia, but that comes from an Assyrian source. However, the inscriptions that Mr. Philby has so laboriously copied and brought back contain a great deal that is of interest.

The little rock on the southern side of the 'Uqla hill, with the building on top of it, has a whole series of inscriptions referring to Himyarite kings, of whom there were four altogether who visited this place and repaired the building. They left behind them inscriptions stating that they had done so, and their followers and all their courtiers with them added their names, and so perpetuated the fact of their having helped. Fortunately, one of those kings is known from other sources, so that we are more or less able to date this series of inscriptions. They probably belong to the third century A.D.; just, in fact, in the last stages of the ancient Hadhrami kingdom, because after that time, about A.D. 300, the power of Saba, or Sheba, expanded and absorbed the ancient kingdom of Hadhramaut.

From Duraib, Khirbat Sa'ud, and Asahil we have inscriptions in another dialect, which are considerably older than the ones to which I have just referred. There are two Sabaeans who mention themselves as having undertaken extensive repairs to buildings, and they are, interestingly enough, two very important personages of that time, being the ones by which the chronology of the ancient Sabaean history is established. One of them is mentioned in an Assyrian document of Sargon of 715 B.C., and the other is mentioned in another document of his successor, Sennacherib, of roughly 685 B.C. They belong to the oldest period of the Sabaean kingdom, before its expansion.

Besides the historical content there are some small points to be gathered from the inscriptions in regard to the organization of the tribes. It was already known that they were organized on a sort of military basis, in such a way that the king demanded service from his various subjects; that is, the heads of the tribes were subject to him, not only when the king wanted to go to war but also when public works had to be undertaken. On the first occasion when the great dam of Marib was destroyed, whether by volcanic eruption or the legendary rat, it was repaired, and the Sabaean ruler of that date mobilized all the peoples underneath him as if they were going to war. They advanced and attacked the task of repairing the dam. The inscription recording that has some interesting details with regard to the number of oxen and the number of loads of dates and honey consumed on that occasion.

The 'Uqla inscriptions were mainly composed by the Hadhrami kings, but in one we read that there were two Himyarite chiefs who engaged in this service, and it would appear from the end of the inscription that the King of Sheba had lent to his ally at the time his own vassals, and that they had to go and help his ally repair the building. That would be, no doubt, shortly before the outbreak

of the hostilities which resulted in the absorption of the Hadhrami kingdom, because the inscriptions in that place are not likely to have been very much earlier than A.D. 200. Evidently the King of Sheba later repented that he had helped his colleague, and made an attack in force, which resulted in the total destruction of the kingdom; and possibly that very blockhouse to which Mr. Philby referred may have been used during the campaign.

Dr. L. R. Cox: On his latest journey, as on previous occasions, Mr. Philby has not neglected to make a collection of rocks and fossils, of which the fossils have been submitted to myself and a colleague for determination.

The most interesting of the specimens came from the necropolis on the 'Alam Aswad ridge. Mr. Philby tells me that here the fossiliferous rocks consist of about 200 feet of limestone. The fossils which he brought back consist partly of casts of mollusc shells and partly of branching hydrozoa which are remarkable for their size and abundance. One hydrozoan specimen is something like a very large human hand, the various branches corresponding, as it were, to the fingers.

Another rather remarkable specimen from the same locality is a large nodule formed of a growth of coral and enclosing a very clear mould of the exterior of a shell. I have been able to run down the species, and Mr. Philby's specimen is much better than any specimen of this species figured from Europe. There can be no doubt as to the approximate age of these specimens, because they include several well-known Jurassic species. Probably they belong to the Lower Kimmeridgian stage of the Jurassic and are of about the same age as the collections made by the French geologist, Pierre Lamare, from near Amran in the Yaman, about 130 miles west of Mr. Philby's locality. Farther south rocks of the same age are known in the Aden hinterland, but the facies is there rather different. The Jurassic rocks of the Jebel Tuwaik area which Mr. Philby discovered several years ago belong to the Callovian stage, and hence are older than those in the area of which he has spoken to-night.

From the ruins of Shabwa farther east specimens collected by Mr. Philby include Eocene fossils belonging to the genus *Campanile*, and a short distance from this locality, at Khashm Rumaid, fossils of the same age were found by him *in situ*. These Eocene beds are, no doubt, a continuation of those which occur farther east in the hinterland of Mukalla and were discovered a few years ago by officers of the Egyptian Geological Survey who were temporarily working there.

I should like to express, as a geologist, my appreciation of the great work which Mr. Philby has done in elucidating the geological as well as the geographical structure of the centre of the Arabian peninsula. A few years ago the whole of this tract was blank on all geological maps. Now we are able to mark with a fair degree of accuracy the main geological formations and their boundaries. In fact, the whole structure of the Arabian peninsula is really quite simple. The details remain to be filled in by future work, but the main features are now known, thanks to Mr. Philby's explorations.

Mr. N. B. Kinnear: Previous to Mr. Philby's travels in Arabia our knowledge of the birds of that country was confined to isolated areas, all within some hundred miles or so of the coast. It is noteworthy too that the principal contributors were well-known members of this Society; Wyman Bury collected birds in the Yaman; Yerbury and Meinertzhagen in the Aden area; Colonel Boscawen and Mr. Ingrams in Hadhramaut; Cheesman in Hasa; and Sir Percy Cox in Muscat.

In his journey Mr. Philby obtained three outstanding novelties, namely the Chukar partridge (*Alectoris graeca philbyi*) which has a black throat and is

darker and smaller than the well-known black-headed bird of the Aden hinterland; a woodpecker (*Desertipicus dorae*) from near Abha; and strangely enough a race of the common magpie from the highest parts of the Asir mountains. The woodpecker is of special interest since it is quite distinct from any African or Asiatic species, and is the first of its kind to be found in Arabia. This bird has been named in honour of Mrs. Philby.

In the deep valleys with considerable vegetation on the Red Sea side of the Asir mountains the birds are either the same, or very like, those found in Abyssinia; while on the other side of the mountains they are truly Arabian and similar to those of the desert region which separates the Plaearctic from the Ethiopian or African region. Some of the Abyssinian species, it is true, filter through to the Arabian side, but not many.

Two well-known African birds of prey, the Bateleur eagle (*Terathopius ecaudatus*), and the Gabar hawk (*Melierax gaber*), were found in Arabia for the first time by Mr. Philby. To the list of the large number of migrants from Asia which pass through Arabia every spring and autumn he added the icterine warbler. Some of these migrants it is true remain in Arabia for the winter and, in the same way, some either injured or non-breeding birds spend the summer there. In this last category Mr. Philby noted in June and July the yellow wagtail (*Motacilla flava flava*); the black-headed yellow wagtail (*Motacilla flava feldegg*); the common swallow (*Hirundo rustica*); the willow warbler (*Phylloscopus trochilus*); the common sandpiper (*Tringa hypoleuca*); and the ruddy sheldrake (*Casarca ferruginea*).

At Najran a ring from a stork's leg (*Ciconia ciconia*), shot in September 1935, was given to Mr. Philby, and it appears that this ring was put on the bird as a nestling in June of the same year in Silesia. Another ring came into his possession in September 1936, which had been taken from a bird shot out of a large flock at Wadi Minwab in Hadhramaut. This bird had been ringed in Bulgaria in June 1936. A third was obtained about 6 September 1936 in Hadhramaut with a small tin attached to its neck containing a note to the effect that it had been released in Bessarabia on 1 August 1936.

Mr. P. M. GAME: Thanks to Mr. Philby's generosity, the rock and mineral collection made during his journey is now in the Mineral Department of the Natural History Museum, and any one interested may see it there. It is hoped that, when the examination of the collection is complete, it may be possible to summarize the main events in the geological history of this part of Arabia and to make a rough geological map.

There are one or two points of especial interest which I would like to mention. The first is the possibility of oilfields. You have heard Mr. Philby refer to his discovery of oil-soaked rocks. In the collection, from three separate localities, Milh Khirwa, Milh Maqa, and Shabwa itself, oil shales and bituminous limestones outcrop around the margin of the salt plugs. The salt was originally deposited below the shales and limestones. During subsequent movements of the earth's crust it pushed its way through the overlying strata and brought up rocks which would otherwise have remained hidden and which normally occur below the surface. These rocks, strongly tilted, are rich in oil. It can be said therefore that there exists a horizon of oil shales and limestones at some unknown distance below the surface over an area which is at least 20 miles from north to south, and may be greater. More than this at present we cannot say. It is not possible to forecast, for instance, whether there are suitable structures or reservoir rocks for the storage of oil in commercial quantities. It is of great interest to note that there are possibilities in this area of future oilfields.

The second point that I would like to mention is the evidence of a past climate

very different from the present dry one. From Jabal Kudd, near Darb, Mr. Philby brought back a very finely crystalline sandstone—we may call it a siltstone—with alternating bands of finer and coarser material in layers of regular thickness, the rhythm being repeated many times in one small sample. It seems a fair inference that the alternations are produced by alternating wet and dry seasons, and that the siltstone may have been laid down on the floor of lakes by glacial rivers, which were able to bring relatively coarse material in times of summer flood and at other times only fine silt. Such rocks are well known in various parts of the world and many of them are thought to have been formed on the floors of glacial lakes. It perhaps seems strange to suggest that there was once a glacial period in Arabia, but it is a possibility. A monsoonal climate, with well-marked wet and dry seasons, might produce such a rock.

The last point to which I refer is connected with the very fine silt from the lower valley of Jauf, near Thaniya, in which Mr. Philby's cars got stuck. It is an extremely fine-grained soil, and in it was found quite a large content of humic matter, also sodium sulphate, calcium carbonate, and a large proportion of minerals from the surrounding metamorphic rocks and granites. I think probably that this soil was formed in old lakes near the present course of the wadi, in which vegetation, perhaps lowly vegetation, had flourished and died, leaving an accumulation of organic matter. The cars sank into this soil because of its extremely fine-grain size.

I would like to stress our very great indebtedness to Mr. Philby for the interesting collection he has brought back, and for adding very considerably to our ideas on the structure of Arabia.

The PRESIDENT: I may say that a little earlier to-day I was informed by one of my predecessors in the Chair that on the last occasion that Mr. Philby gave a lecture here he intimated very definitely that that would be the last time he would address the Society. Well, he has come out again to give another performance, and one can only hope that, like all the great "stars," he will come forward again many times and make many other "positively last appearances."

It is perfectly obvious from what Mr. Philby has said, and from what others have said before, that the region with which he dealt is one which bristles with interesting matter. Personally I would express the hope that the surface indications in regard to the antiquity may be followed up in the near future by excavating work under the soil. The soil must be saturated with hitherto unrevealed history, and one only hopes that the survey work which has been conducted in such an able manner by Mr. Philby and his predecessors will be followed up in an intensive manner by excavation. He has revealed a number of sites which obviously are calling for exploration. I hope that archaeological investigation will be encouraged.

Though there is a great deal I would like to have said in connection with the very interesting communication to which we have listened, I must not now detain you. On your behalf I congratulate Mr. Philby on having accomplished a most valuable piece of work, for which we offer him our hearty thanks.

THE AIR ALMANAC: Discussion on the new form of Nautical Allowance for rapid position finding

Afternoon Meeting of the Society, 14 March 1938

THE PRESIDENT (Professor HENRY BALFOUR): This evening we are to discuss the Air Almanac, its merits and possibly its demerits, and I hope that those who have opinions on the subject will express them freely. It is hoped that, through the accumulation of ideas and information in that way, our discussion will have a practical outcome, because the Air Almanac, which is the counterpart of the Nautical Almanac for seamen, is a thing of very great importance indeed. We are fortunate in having with us this evening the Astronomer Royal, who has kindly undertaken to open the discussion.

The ASTRONOMER ROYAL (Dr. H. SPENCER JONES): I have been asked in opening this discussion mainly to describe the Air Almanac, which has been produced by H.M. Nautical Almanac Office in co-operation with the Air Ministry, for the purpose of air navigation.

The needs of air navigation rendered a special Almanac desirable. In the first place, aircraft move very much faster than surface craft, and it is of prime importance to the air navigator that he should be able to reduce his sights and get his position in the minimum possible time. Aircraft may move at 200 or 300 miles an hour, and you will realize that the navigator cannot afford to spend ten or fifteen minutes in reducing sights. Secondly, the observation of altitude of object from an aircraft using a bubble sextant is not quite comparable with that from a surface craft using the ordinary type of sextant. It is not possible to obtain the same accuracy, and it is therefore not necessary that the Air Almanac should give the data with the accuracy required for surface navigation.

This discussion has in a sense come at a rather unfortunate time, because the arrangement of the Air Almanac will be very much changed in a few months' time. I propose to speak about the Air Almanac in its present form.

It is perhaps desirable for me first of all to explain, for the benefit of those who are not navigators, what the problem is.

The observation made by the navigator consists of the determination of the altitude of a heavenly body, which may be the sun, the moon, one of the planets or one of the fifty brightest stars, with a bubble sextant, and what that observation gives is in effect the zenith distance for a known Greenwich Mean Time.

The data given by this observation enable the point U on the Earth's surface, which has the heavenly body in its zenith, to be determined. This point is called the sub-solar point in the case of the sun and the sub-stellar point in the case of a star; it is generally known as the geographical position of the body observed.

The Greenwich Mean Time of the observation being known, the declination of the body at the time of observation is obtained from the Ephemeris. The latitude of the point U is equal to this declination. The longitude of U, measured westwards from Greenwich, is the Greenwich Hour Angle of the

body that has been observed. For convenience and speed in the reduction of the observation, it is convenient to tabulate this quantity.

The observation of altitude gives the true zenith distance of the body observed. If a small circle be drawn on the Earth's surface, with centre at U and with angular radius equal to the zenith distance of the body, then the observer must have been somewhere on this circle at the time of observation.

In practice we take an assumed position, which may be the dead reckoning position or may be some position chosen conveniently near. We call this position D. Then the distance of U from D and its azimuth with respect to the meridian through D can be obtained by computation or can be obtained by the aid of special tables, which in effect tabulate all possible solutions of the spherical triangle. If DU meets the small circle drawn round U in the point J, the distance DJ is known (viz. DU minus zenith distance), and also its azimuth; hence J can readily be marked on a chart. A line through J at right angles to DJ is called the position line and the observation of one body tells us that the observer must be somewhere on this line.

What the navigator does is to observe one object, S, and to draw the position line, working on some assumed position, and then to observe a second suitable selected object and to draw a second position line, and the point at which those two position lines intersect is his position.

The Air Almanac gives directly the Greenwich Hour Angle (G.H.A.) in arc instead of in time, this being the quantity with which the navigator is concerned, and also the declination. Those data are given for the sun, the moon, and the four planets used in navigation—Venus, Mars, Jupiter, and Saturn—and then data are given for fifty of the brightest stars.

The Greenwich Hour Angle and the declination are tabulated at intervals of one hour for the sun and the moon and at intervals of six hours for the planets. These data are given on loose sheets which can be attached to the permanent portion of the Air Almanac, so that a navigator need take only the sheets for a day or two with him in the aeroplane. The accuracy of the data is to the nearest minute of arc, which is sufficient for the purpose of air navigation. In the Abridged Nautical Almanac, used for surface navigation, the accuracy is to one-tenth of a minute of arc. It is necessary to interpolate data between the times for which the data are tabulated. The interpolation is made with the aid of Interpolation Tables which are given in the permanent portion of the Air Almanac.

In the case of the G.H.A. of the sun, it is sufficient to assume a uniform rate of motion of 15° in one hour, and Interpolation Tables based on that uniform motion are given in the first three pages of the permanent portion of the Air Almanac. The declination of the sun is a quantity that changes very slowly and no interpolation is needed. In the case of the planets there is a slight additional complication, because the planets have a slow motion relative to the stars and therefore they do not move through exactly 15° in one hour. The interpolation for the planets is based on fixed differences, as in the case of the sun, together with Correction Tables to account for varying differences in the rate of motion of the planets. Therefore, in interpolating for the G.H.A. of a planet, there is first a main interpolation, as for the sun, based on a rate of 15° in one hour, and then a small subsidiary interpolation

very easily made from the Tables given. For the declination of a planet, the Tables of Proportional Parts are based on the mean value of the change, and it is sufficiently accurate to use the one Table for the whole of the two days. The Moon is slightly more complicated because it has a rapid motion amongst

STARS, 1938 MARCH 14 and 15

No.	Name	S.H.A.	Dec.	G.M.T.	G.H.A. of First Point of Aries = G.H.A. ♈ 00m	10m	20m	30m	40m	50m
					Monday, March 14					
		° ′	° ′	h	° ′	° ′	° ′	° ′	° ′	° ′
1	ACHERNAR	336 09	S. 57 33	00	170 57	173 28	175 58	178 28	180 59	183 29
2	ACRUX	174 12	S. 62 46	01	186 00	188 30	191 01	193 31	196 01	198 32
3	*Adara*	255 57	S. 28 54	02	201 02	203 33	206 03	208 33	211 04	213 34
4	ALDEBARAN	291 54	N. 16 23	03	216 05	218 35	221 05	223 36	226 06	228 37
5	*Alhena*	261 28	N. 16 27	04	231 07	233 37	236 08	238 38	241 09	243 39
6	*Alioth*	167 10	N. 56 17	05	246 10	248 40	251 10	253 41	256 11	258 42
7	*Alnitak*	275 35	S. 1 59	06	261 12	263 42	266 13	268 43	271 14	273 44
8	*Alphacca*	126 59	N. 26 55	07	276 14	278 45	281 15	283 46	286 16	288 47
9	*Alphard*	218 51	S. 8 24	08	291 17	293 47	296 18	298 48	301 19	303 49
10	*Alpheratz*	358 42	N. 28 45	09	306 19	308 50	311 20	313 51	316 21	318 51
11	ALTAIR	63 03	N. 8 42	10	321 22	323 52	326 23	328 53	331 24	333 54
12	*Anilam*	276 44	S. 1 15	11	336 24	338 55	341 25	343 56	346 26	348 56
13	ANTARES	113 35	S. 26 18	12	351 27	353 57	356 28	358 58	1 28	3 59
14	ARCTURUS	146 47	N. 19 30	13	6 29	9 00	11 30	14 00	16 31	19 01
15	γ Argus	238 05	S. 47 10	14	21 32	24 02	26 33	29 03	31 33	34 04
16	ε Argus	234 41	S. 59 19	15	36 34	39 05	41 35	44 05	46 36	49 06
17	*Bellatrix*	279 33	N. 6 18	16	51 37	54 07	56 37	59 08	61 38	64 09
18	*Benetnasch*	153 43	N. 49 37	17	66 39	69 10	71 40	74 10	76 41	79 11
19	BETELGEUSE	272 02	N. 7 24	18	81 42	84 12	86 42	89 13	91 43	94 14
20	δ Canis Maj.	253 32	S. 26 18	19	96 44	99 14	101 45	104 15	106 46	109 16
21	CANOPUS	264 21	S. 52 40	20	111 47	114 17	116 47	119 18	121 48	124 19
22	CAPELLA	281 58	N. 45 56	21	126 49	129 19	131 50	134 20	136 51	139 21
23	*Castor*	247 20	N. 32 01	22	141 51	144 22	146 52	149 23	151 53	154 23
24	β CENTAURI	150 07	S. 60 05	23	156 54	159 24	161 55	164 25	166 56	169 26
25	β CRUCIS	168 58	S. 59 21		Tuesday, March 15					
26	γ Crucis	173 03	S. 56 46	00	171 56	174 27	176 57	179 28	181 58	184 28
27	DENEB	50 10	N. 45 03	01	186 59	189 29	192 00	194 30	197 00	199 31
28	*Denebola*	183 31	N. 14 55	02	202 01	204 32	207 02	209 33	212 03	214 33
29	*Diphda*	349 53	S. 18 20	03	217 04	219 34	222 05	224 35	227 05	229 36
30	*Dubhe*	195 00	N. 62 05	04	232 06	234 37	237 07	239 37	242 08	244 38

Air Almanac: part of page 1 for 1938 March 14 and 15

the stars, due to its orbital motion round the earth. Its Greenwich Hour Angle increases by about 14½° hourly, but the amount is variable, and therefore a special Interpolation Table has been provided, based on fixed differences which correspond to an hourly motion of 14° 20′ in one hour. The advantage is that the interpolation from the Correction Table to refer from

that 14° 20′ hourly motion to the actual hourly motion of the moon has always to be applied in one direction. For the declination of the moon, the Tables of Proportional Parts are based on the mean value of the change in declination. Occasionally there may be two different Tables corresponding

74 SUN, MOON AND PLANETS, 1938 MARCH 14 and 15

G.M.T.	SUN G.H.A.	SUN Dec.	MOON G.H.A.	MOON Dec.	MOON P.PS.	MOON P. in A.
	Monday, March 14				**G.H.A.**	
	S.D. 16′·1		S.D. 16′·0	H.P. 58′·8	m ′	Alt. ° + Corr. ′
h	° ′	° ′	° ′	° ′	05 1	
00	177 36	S. 2 53	26 15	N. 8 45	10 2	10 58
01	192 36	2 52	40 44	8 34	15 2	15 57
02	207 36	2 51	55 13	8 22	20 3	20 55
03	222 37	2 50	69 42	8 10	25 4	25 53
04	237 37	2 49	84 11	7 58	30 5	30 51
05	252 37	S. 2 48	98 40	N. 7 46	35 6	35 48
06	267 37	2 47	113 09	7 34	40 6	40 45
07	282 37	2 46	127 39	7 22	45 7	42 44
08	297 38	2 45	142 08	7 10	50 8	44 42
09	312 38	2 44	156 37	6 58	55 9	46 41
10	327 38	S. 2 43	171 06	N. 6 46	60 10	48 39
11	342 38	2 42	185 36	6 34	**Dec.**	50 38
12	357 38	2 41	200 05	6 22	m ′	52 36
13	12 38	2 40	214 35	6 09	05 — 1	54 35
14	27 39	2 39	229 04	5 57	10 — 2	56 33
15	42 39	S. 2 38	243 34	N. 5 45	15 — 3	58 31
16	57 39	2 37	258 03	5 33	20 — 4	60 29
17	72 39	2 36	272 33	5 20	25 — 5	62 28
18	87 39	2 35	287 02	5 08	30 — 6	64 26
19	102 39	2 34	301 32	4 56	35 — 7	66 24
20	117 40	S. 2 33	316 02	N. 4 43	40 — 8	68 22
21	132 40	2 32	330 32	4 31	45 — 9	70 20
22	147 40	2 31	345 01	4 19	50 —10	72 18
23	162 40	2 30	359 31	4 06	55 —11	74 16
	Tuesday, March 15				60 —12	
	S.D. 16′·1		S.D. 15′·9	H.P. 58′·3	**G.H.A.**	Alt. ° + Corr. ′
00	177 40	S. 2 29	14 01	N. 3 54	m ′	
01	192 40	2 28	28 31	3 41	05 1	10 57
02	207 41	2 27	43 01	3 29	10 2	15 56
					15 3	

G.M.T.	PLANETS G.H.A.	PLANETS Dec.	P.PS.
	Venus, −3·4		G.H.A.
	° ′	° ′	V. M.
h	**Mar. 14**		h m ′ ′
00	168 36	S. 0 23	0 30 0 0
06	258 34	0 15	1 00 0 1
12	348 32	S. 0 07	1 30 −1 1
18	78 30	— 0 00	2 00 −1 2
	Mar. 15		2 30 −1 2
00	168 27	N. 0 08	3 00 −1 3
06	258 25	0 16	
12	348 23	0 23	3 30 −1 3
18	78 21	0 31	4 00 −2 3
24	168 19	0 39	4 30 −2 3
	Mars, 1·6		5 00 −2 4
	° ′	° ′	5 30 −2 4
	Mar. 14		6 00 −2 5
h			Dec.
00	141 57	N. 12 02	V. M.
06	232 01	12 06	h ′ ′
12	322 06	12 10	1 ∓1 +1
18	52 10	12 14	2 ∓3 +1
	Mar. 15		3 ∓4 +1
00	142 14	N. 12 18	4 ∓5 +1
06	232 19	12 22	5 ∓6 +1
12	322 23	12 26	6 ∓8 +1
18	52 28	12 30	
24	142 32	12 33	
	Jupiter, −1·6		G.H.A.
	° ′	°	J. S.
h	**Mar. 14**		h m ′ ′
00	208 58	S. 15 36	0 30 1 1
06	299 10	15 35	1 00 2 1
12	29 21	15 35	1 30 3 1
18	119 33	15 34	2 00 4 1

Air Almanac: part of page 2 for 1938 March 14 and 15

to two different values of the motion. The additional data given are the semi-diameter of the sun and the semi-diameter of the moon, and there is a table which gives the correction to be applied for the moon's parallax, corresponding to the altitude of the moon at the time of observation. All the astronomical data for the sun, the moon and the planets, apart from refraction (the effect

of which can be included in special tables), can therefore be obtained from one opening of the Air Almanac. That is one of the special features of this Air Almanac and a feature in which it is superior, I think, to other Air Almanacs that have been produced.

Data are also given for fifty stars. Instead of the right ascension of the stars being given, the quantity tabulated is what is called the Sidereal Hour Angle. The Sidereal Hour Angle of a star is the hour angle measured westwards from the First Point of Aries. It is therefore, in other words, 360° minus the right ascension of the star, which is a quantity which in the French Air Almanac is called the *ascension verse* (*i.e.* left ascension). The Greenwich Hour Angle of a star is equal to the Greenwich Hour Angle of the First Point of Aries plus the Sidereal Hour Angle of the star. The Sidereal Hour Angle of the star is a quantity that varies very slowly through the year, depending only on the slight change in apparent position of the star, but the Greenwich Hour Angle of the First Point of Aries is a quantity that varies rapidly. It is necessary to interpolate it for the Greenwich Mean Time of the observation. This quantity is tabulated at intervals of 10′, and the interpolation for intervals of less than 10′ is obtained from a fixed table given on the inside of the cover of the permanent portion of the Almanac. For the declination of the stars no interpolation at all is needed.

The stars are listed in the alphabetical order of their proper names or of the constellation. The twenty-one brightest stars, that is, the stars brighter than magnitude 1·5, are given in small capitals, so that they are easily picked out. The other stars are given either by the name of the constellation and the Greek letter or by a proper name, the proper names being printed in italics. Inside the front cover of the permanent portion of the Air Almanac is given a permanent index list arranged in order of the Sidereal Hour Angle and giving also the right ascension and declination of the stars; these can be used to determine the name and number of any observed star, once its approximate Sidereal Hour Angle and declination, or right ascension and declination, have been determined by a star globe or planisphere. In the index list the twenty-one brightest stars are given in bold type, enabling easy identification.

As an astronomer, I should like to criticize the names given to some of these stars. I suppose they have been decided upon really by the navigator, who prefers to use the proper name of the star rather than the astronomical name, but I do think that Acrus, which seems to be copied from the American Almanacs and is a sort of abbreviation for αCrucis, is philologically horrible. Again, a star which is familiar to everyone who knows the southern sky as the brighter of the two pointers to the Southern Cross, αCentauri, appears as Rigel Kent. That is a minor point, of course. The Air Almanac has been produced mainly for navigators, and if they like to use these and other queer names I suppose we should not criticize them too much.

In addition to this material, the Air Almanac contains a special Pole Star Table, which gives the corrections to be applied to the observed altitude of the Pole Star in order to determine the latitude. It is a very simple table and very convenient in use whenever it is possible to observe the Pole Star.

Summing up the general features of the Air Almanac as at present issued, they are: the quarterly issue in loose-leaf form; the accuracy of one minute of

arc instead of one-tenth minute of arc, as in the Abridged Nautical Almanac (in spite of that smaller degree of accuracy a larger number of pages is necessary in the Air Almanac as compared with the Nautical Almanac, because of the use of the rapidly varying quantity, the Greenwich Hour Angle); and the use wherever possible of critical Tables which enable data to be taken from Tables without any interpolation.

I should like to say a word or two about accuracy. The Air Almanac claims to be accurate to the degree stated, that is, to the nearest minute of arc. Of course, errors larger than that may arise from an accumulation of rounded-off errors. Any interpolation between two quantities may lead to an error of one unit in the last place, so that the maximum error obtainable can be rather greater than one minute of arc as the result of adding two or three quantities together. The maximum possible error, which is most likely to occur in the Greenwich Hour Angle of the moon, may really be one and a half minutes of arc.

It may be of interest if I say a few words about the way in which this Almanac compares with other Almanacs that have been produced to meet the special needs of air navigation. There is a French Almanac, which gives what is called the *ascension verse*, that is, 360° minus the right ascension, together with declination and Greenwich Sidereal Time. By adding the Greenwich Sidereal Time to the *ascension verse* we get the quantity which is called in our Almanac the Greenwich Hour Angle. These quantities are tabulated for intervals of twenty minutes for the sun, the moon, Venus and Mercury, and at intervals of two hours for Jupiter and Saturn. One sheet, that is, two pages, is used for the data for a single day. The stars however are very badly provided for, and the arrangement for obtaining data when any star is observed is not nearly so convenient as in the British Air Almanac.

The Americans produced an Air Almanac, I think, for one year only—1933—which gave for the sun the Greenwich Hour Angle and declination at intervals of one hour. That was in one section, and in a separate section there were given for the moon the Greenwich Hour Angle and declination at intervals of ten minutes. For the planets, the Greenwich Hour Angle and declination were given at intervals of twenty-four hours. In addition there were given the variation of Greenwich Hour Angle per minute and the variation of declination per hour, and supplementary tables had to be used for interpolation, based on those special variations. For the stars there were given the Greenwich Hour Angle of the First Point of Aries and the Greenwich Hour Angle of the stars, tabulated at intervals of twenty-four hours, together with Correction Tables. These data for the different bodies were given in different sections of the book, so that the data for one day or for two days were not easily accessible in collected form. If a navigator observed, say, a planet and a star, to get his two position lines he would have to look first in one part of the volume and then in another part. The American Almanac as a separate Air Almanac has now been given up, and what corresponds to our Abridged Nautical Almanac is now used by the Americans for the purpose of air navigation. That gives the same quantities as before, arranged in more or less the same way, but to an accuracy of one-tenth of arc, the accuracy needed for surface navigation, so that there is a higher degree of accuracy than is required in air navigation. The Almanac suffers from the same dis-

advantage as the American Air Almanac, that the data for different bodies are to be found in different sections of the volume.

I mentioned at the beginning of my remarks that the arrangement of the British Air Almanac is shortly to be changed considerably. The general direction of the change will be to give data at more frequent intervals. The Greenwich Hour Angle of the sun and the Greenwich Hour Angle of the First Point of Aries will be given at intervals of ten minutes, and the declination of the sun will be given at intervals of one hour. For the planets the Greenwich Hour Angle and declination will be given at intervals of one hour, instead of six hours as at present, and for the moon the Greenwich Hour Angle and declination will be given at intervals of ten minutes. In the new form one sheet, that is, two pages, will correspond to one day, so that the number of pages in the Almanac will be exactly doubled.

Those are briefly, I think, the main features of the Air Almanac as it has been produced and of the revised form which will be brought out in due course.

The PRESIDENT: The Astronomer Royal has been referring in the main to the Almanac as it is to-day, and it would be interesting to hear about the future development of the Air Almanac. Wing-Commander Mackworth of the Air Ministry is present, and I will ask him to supplement the remarks of the Astronomer Royal in that connection.

Wing-Commander P. H. MACKWORTH (Air Ministry): I should like to tell you the reasons why we want to alter the Air Almanac. The Astronomer Royal referred to the speed at which modern aeroplanes travel and to the need for the navigator being able to work out results quickly; but that is not the whole of the matter. When a man is in the air he may be very cold indeed, and when his fingers are numb with cold he cannot turn over small pages rapidly. There is another very important point which I think is often overlooked, that is, the numbing effect on the ordinary human brain of a long flight. I do not know whether the noise of the engine is the cause of it, but there is no doubt whatever that, when it comes to thinking out problems, the brain is about 50 per cent. less active after two or three hours' flying. Therefore we should provide for all the things which the airman has to work out being matters of routine as far as possible, and every process should be the same; he should not have to think out each time what the process is. It may not seem anything more than a detail to you when you are on the ground, but in the air a man's brain cannot work out a problem easily. If you can give him a thing which is a matter of absolute routine he will do it automatically, and it is for that reason that we think the Air Almanac as at present produced can be improved.

We want to do two things: to standardize the way of looking up the information, and to reduce to a minimum the amount of interpolation and the number of separate little tables which have to be looked into for each quantity, thus avoiding turning over pages.

The proposals which are going to be put into effect on January 1 next year are to do away with the permanent part of the Almanac as it is to-day and to produce, probably every three months, a volume which will be finished with at the end of that period. It will have covers made of cardboard, on which part of the present permanent information as now printed will appear, and the remainder of it—the majority of it—will be printed on pages which can be torn out one by one as they are used up.

What is printed on the inside of the front cover of the new Almanac will be almost exactly the same as what is printed on the inside of the cover of the permanent part of the present Air Almanac. There will be a Star Index, and an Interpolation Table for the Greenwich Hour Angle of the First Point of Aries, and also for the sun. On the first ephemeral page there will be a Table for the Greenwich Hour Angle of the First Point of Aries for every ten minutes, as at present, but below that, instead of another Table for the next day, there will be a similar Table for the sun, giving the Greenwich Hour Angle for every ten minutes and the declination every hour. Those two Tables will be corrected for the exact time with the Interpolation Table exactly opposite to them on the inside of the cover, so that, to work out anything to do with the stars or the sun, no turning of pages, once the book has been opened at the first page, will be necessary. The whole interpolation can be done on the spot. On the first ephemeral page there will also be the Greenwich Hour Angle of the planets, for every hour. There will be room for only three, as far as we know at the moment, and so whichever planet happens to be the least important at the moment, the least bright or near to another one, will be left out. The information will have to be printed for every hour because there will be no room to give it for every ten minutes, but that will be the only information which will not be standardized to the ten minutes.

The other side of the first ephemeral page will be devoted entirely to the moon. There will be a Table exactly similar to that for the sun, giving the Greenwich Hour Angle of the moon for every ten minutes and the declination also for every ten minutes. The interpolation for the moon will be done on the same page, and an Interpolation Table suitable for the individual day will be printed alongside that for the Greenwich Hour Angle and the declination. That will avoid the present difficulty of having to look up the interpolation for the moon in the permanent part of the book and then to add the correcting term given under the heading of "Proportional Parts." That involves two processes, as well as having to get out the main figure, so that there are three things to be looked up and added together before one gets the answer. In the new edition of the Air Almanac there will be a simple Interpolation Table alongside the Table for the Greenwich Hour Angle and the declination, and there will be no proportional parts to be considered at all. The Table of Parallax in Altitude will also be on the same page, and the Table will be of the present pattern.

At the end of each quarter there will be an ephemeral sheet containing the Pole Star Table, just as it is at present. Inside the back cover and on the page opposite to it there will be an Interpolation Table for the planets for every hour, and that Table will be very similar to the Table now used for the sun in the present edition of the Air Almanac. For the planets at the present time one has to look up four quantities in the Air Almanac: first of all there is the main figure, given for every six hours; then one has to allow for the odd hours; then there is the interpolation of the Greenwich Hour Angle in the Planet Table; and lastly there is the proportional part. I think there is a very good chance of a mistake being made before one gets to the final answer. In the new edition of the Air Almanac, one will have to look up the Greenwich Hour Angle on the first ephemeral page and one will have to refer to one Interpolation Table, and that is all that will be necessary.

With those alterations, although there will be twice as many pages in the book as there are now, we shall never have to turn over a page to get the quantities out, with the one exception of the planets, and one turn will do that. All the bodies listed in the book will have the figures given for every ten minutes, with

the one exception of the planets again. I think we shall have a much more simple book for the airman to use and there will be much less likelihood of mistakes being made.

The PRESIDENT: We have with us Commander van Balkom, the Chief Pilot of the Royal Dutch Air Lines, and it would be very interesting if he would give us his experience of the various Air Almanacs.

Commander van BALKOM (Royal Dutch Air Lines): I did not come here prepared to take part in the discussion, but I am very glad to tell you something about my experience in this matter.

I have not used in practical work the British Air Almanac as it is now; I know it only because I have seen it. I have worked with the French Almanac and with the American Almanac. Personally I very much prefer the French Almanac, which has already been mentioned this afternoon. Its main feature is that the way of using it is the same for the sun, the planets, and the stars. The use of the *ascension verse* is of very great importance, because it avoids the navigator having to subtract things to find the Greenwich Hour Angle and also provides a uniform method for all heavenly bodies, which of course means that there is less likelihood of errors being made. That is why I prefer not the Greenwich Hour Angle but the Sidereal Hour Angle being tabulated, as is done now in the British Air Almanac.

I quite agree that it is very important to make the process that is used a matter of routine and to avoid different methods having to be used for different bodies. It is also very important to be able to find things in the Almanac at convenient places and not to have to turn over pages.

I think that the proposed changes in the Air Almanac mentioned by the last speaker will really be improvements. Of course it is not easy for me now to compare in detail the proposed new British Almanac with the French Almanac, but I think the features in the French Almanac to which I have referred should be kept in mind when the revision is made.

The PRESIDENT: The subject is now open to general discussion. I hope that those who have views to offer or questions to ask will not hesitate to put them forward and to discuss the Air Almanac favourably or otherwise. We have quite open minds on the subject at present.

Mr. P. F. EVERITT (Research Engineer, Henry Hughes and Sons, Ltd.): I have to solve navigation problems without being a navigator and like to take the point of view of the pupil who has to be taught. Wing-Commander Mackworth said that one of his principal aims was to have a uniform process, and with that I entirely agree, because it means that the pupil has to learn only one method instead of two or more. From his point of view we can approach the Air Almanac problem and lay down conditions which are ideal: one single method applicable to all bodies, and the easiest possible interpolation method. The existing Air Almanac has no less than three different main Interpolation Tables for the Greenwich Hour Angle of the sun, of the moon, and of the stars. That is inconvenient.

In the French Air Almanac there is a much more logical system, although it is not perfect. Instead of tabulating the Greenwich Hour Angle of the sun in one place and the Greenwich Hour Angle of the moon in another, with their own appropriate Interpolation Tables, and the Greenwich Hour Angle of the First Point of Aries with its own Interpolation Table, they have tabulated only the Greenwich Sidereal Time and the *ascension verse* or the Sidereal Hour Angle of the body. They give for the stars the mean value of the S.H.A. for every hour; for the sun and moon they give it for every twenty minutes. A secondary Correction Table is necessary only for the moon, and that can be

worked very simply. Therefore we have in this particular case the principle advocated by Wing-Commander Mackworth carried out, that one process only shall be employed.

Even in the new Air Almanac that has been described by Wing-Commander Mackworth, the Greenwich Hour Angle of the sun will be tabulated, the Greenwich Hour Angle of the Moon will be tabulated, and, when we come to the stars, the Greenwich Hour Angle of the First Point of Aries will be tabulated. There will be two different methods instead of one uniform process, and there will be a number of Interpolation Tables—for the sun, for the moon, and for the planets. It is perfectly true that when we are dealing with the sun we seem to have only two quantities, the Greenwich Hour Angle as tabulated and the correction, but in every other case there will be three quantities, because of the differences, and the price we pay for saving one quantity when dealing with the sun is three main Interpolation Tables, which is a nuisance. It is true that the nuisance is decreased by the Interpolation Tables being put on the pages where we want them, but it would be much better to have one only and to have that inside the cover, where we want it.

In the American Almanac there are three quantities for the sun, for the moon, and for the stars, and they are a nuisance to get at. In the French Almanac there are also three quantities for each. In our own Air Almanac we have two for the sun, three for the moon and stars, but we pay a long price in inconvenience for having one quantity less, and it is not worth it.

I would suggest that, if we adopted the fundamental idea of combining the Greenwich Hour Angle of the First Point of Aries or the Sidereal Time at Greenwich, which is the same thing, with the Sidereal Hour Angle, and tabulated in that way for every body that we are going to use, we should get uniformity of process, we should reduce the amount of teaching required, we should reduce the number of Interpolation Tables, and we should reduce the chance of error.

Mr. D. H. SADLER (Superintendent of the Nautical Almanac): I think I should reply to Mr. Everitt's criticism of the present Air Almanac. I will admit quite freely that the Air Almanac is not perfect, but there is one very important point that I want to make, namely, that the present Air Almanac is only half the size of the French Almanac. It is quite clear that if the size of the publication is doubled it must be possible to make the information slightly easier to obtain.

Coming to the specific points that Mr. Everitt mentioned, I wish to say that, in my opinion, the ideal method of tabulating quantities in an Almanac intended to give the Greenwich Hour Angle directly, is to tabulate the Greenwich Hour Angle alone and to provide the necessary Interpolation Tables to interpolate it. We find that we can do that relatively easily for the Sun, the Moon, and the planets, because there are only one Sun, one Moon, and four planets used for navigation, but one cannot tabulate the Greenwich Hour Angle conveniently for fifty stars. Consequently we came to the conclusion that it was preferable to adopt the Sidereal Hour Angle and to tabulate that quantity, and we did that deliberately, knowing that it was a different method, because we did not attach an enormous amount of importance to the practical significance of the method.

I am in complete agreement with what Wing-Commander Mackworth said, and what he said was certainly taken into consideration in the construction of the Almanac, but the pilot does not want to know that he has to take out the Sidereal Hour Angle and to add it to the Greenwich Hour Angle of the First Point of Aries; all he wants to know is that he takes a quantity from a certain position and adds it to the quantity taken from another position, and in the present Almanac I do not think that anything can be simpler for the stars than

to have just the one page containing nothing but the tabulations for the stars and the First Point of Aries.

Mr. EVERITT: That is the same as the French Almanac.

Mr. SADLER: Yes, it is the same in principle as the French Almanac, but in the French Almanac the stars are on a separate sheet, and it is extremely difficult to look up the Greenwich Hour Angle of the First Point of Aries on the relevant page for the particular day and to turn to the permanent portion of the Almanac to find the tabulation for the stars. I will admit that it is not perfectly logical, but I do think it is permissible to have a different method for the stars from the method adopted for the Sun, the Moon, and the planets.

The old Air Almanac, which was designed in collaboration with the Air Ministry, actually exceeded their original requirements. We decreased the intervals of tabulation and still kept the Almanac to a reasonable size. It was found by the Air Ministry that the application of the small correction factors, which were really a correction for the difference in motion of the Greenwich Hour Angle between the Sun and the other bodies, tended to complicate the Almanac. It was my original intention that these corrections should be applied mentally. I am quite willing now to admit my fault and take into consideration the numbing effect of flying an aeroplane, and I realize that it is unsafe to make corrections mentally when flying. I should say that for any person who is not numbed mentally the application of these corrections is so simple that it is necessary only to write down the one quantity instead of two. I think you will find that the arrangement given in the Air Almanac at present gives the minimum number of operations consistent with the size of the Almanac.

Mr. EVERITT: With regard to Mr. Sadler's statement that the number of pages in the present Air Almanac is half the number in the French Almanac, I would point out that we have just been informed that the number of pages in the new Almanac will be double the number in the present Almanac, so it will be exactly the same as the French Almanac. Therefore that point of Mr. Sadler's falls to the ground.

When we come to the question of uniformity of process, Mr. Sadler still likes to have two different processes, but the number of operations required when one has one uniform process is not increased. The French Air Almanac has exactly the same number of operations.

Mr. SADLER: I should like to point out to Mr. Everitt that in the new Almanac there will be only two operations in the case of the Sun, the Moon, and the planets. The new Almanac will have double the number of pages, but the number of operations required to get the Greenwich Hour Angle will be only two, except in the case of the stars, when the Sidereal Hour Angle will have to be added.

Mr. EVERITT: Is it not worth while to have three operations if you can thereby gain the advantage of having one uniform process, as advocated by Wing-Commander Mackworth, which you still have not attained ?

Mr. SADLER: The process is exactly the same in all cases, with the sole exception that in the case of the stars a quantity is added. In the case of the Sun, the Moon, and the planets there are two figures to look up and add together instead of three.

Mr. EVERITT: These operations can be reduced to schedules—a box for every quantity and every quantity to go into its own box. If one has an empty box one sees at once that something has gone wrong, and, when the numbing effect of many hours of continuous flying is taken into consideration, is not it worth while to have the same number of boxes for each operation—one uniform schedule? It is a question of slightly more labour and an absolutely uniform process or slightly less labour sometimes and not a uniform process.

Wing-Commander MACKWORTH: We do all our work on standardized forms. In the case of a star, one uses the standard form for the star, and one notices it if one has omitted anything.

Squadron-Leader MAY: The advantage of having a uniform process would be counterbalanced by having an extra Interpolation Table. With two processes there is no turning over at all.

Mr. EVERITT: I am not suggesting that the French Almanac should be used in its present form. It could be very much improved, and, if we combined the advantages of the English Air Almanac with the advantages of the French Almanac I take it we should have something which would be practically perfect.

Captain D. C. T. BENNETT (Imperial Airways): There is one criticism that I should like to make, as a user of the Air Almanac: that we have lost a great deal in accuracy in the present Air Almanac. I do appreciate all the advantages of speed, and I think in the new edition it is going to be as much as we can ask for, but there are one or two small points on the question of accuracy in which I think we could get an improvement even without an increase of space. In the case of declination, where there is no interpolation to worry about, I see no reason why we should not put a decimal point and tenths of a minute of arc, and that might also be done in the case of refraction. The Refraction Tables at the end of the present Air Almanac give the figure for every one minute of arc, and unfortunately they give the refraction only for heights below 1000 feet and above 1000 feet, which is not very much good at 16,000 or 20,000 feet, and that is going to be the operational height for most aircraft in the future.

I disagree with Mr. Everitt with regard to having only one method. I prefer to avoid the one little extra operation and use two different methods.

Mr. A. R. HINKS: One cannot but admire the simplification that has been brought about by the tabulation of the Greenwich Hour Angle, which has in effect eliminated the difference between Sidereal Time and Greenwich Mean Time. This simplification is of great advantage to airmen primarily, but it must be of enormous advantage to navigators at sea and also (and I wish to emphasize this particularly) to travellers upon land, because since the Air Almanac and the Greenwich Hour Angle method came out it has been abundantly clear that a traveller upon land who is not a specialist in making observations and who has simply made them in order to find his way about on land, as the navigator does at sea, with a minimum of observation and anxious only to find out where he is, has now totally new possibilities before him. I hope that we may find a number of people anxious to learn these methods, not all of them because they wish to practise them in the air or upon the sea, but upon land.

During the last week or two I have been studying proposals for different Air Almanacs, which are of great interest to this Society, apart altogether from their paramount importance to the country owing to their use in air navigation. When Air Almanacs are being reconsidered and experimented with a grand opportunity arises for seeing whether we cannot make some improvements in nomenclature and terminology. I am going to ask the Astronomer Royal whether he does not think that there is perhaps some better name than Sidereal Hour Angle, and particularly whether we could not find some more compendious word than that old and stupid name, the "First Point of Aries," which really means so little now. It has nothing to do with Aries any longer, and it is represented in Tables by a symbol which not every printer keeps in stock. It seems to me that we might say Greenwich Hour Angle of Zero or something like that, in place of G.H.A. of the First Point of Aries.

I was very glad to hear the Astronomer Royal express horror at some of the names for stars which in the first edition of the Air Almanac have apparently

been adopted from the American. I gather that pilots are generally agreed that every star should have a name of its own; that is convenient, just as it is convenient that each sheet of a map in a series should have a name. When maps have numbers as well as names, we always find people referring to them by their names and not by their numbers.

With regard to the names of the fifty stars in the Air Almanac, there are twenty-six which have proper names, of which twenty-two are Arabic names used in the Abridged Nautical Almanac as well as in the Air Almanac, and those may be said to be well-established names. But in the Air Almanac there are fifteen other Arabic or pseudo-Arabic names; some of them seem to have come through the French and some through the German, and consequently the Arabic itself is not very consistent. There are names like Benetnasch and Schedar, and in addition there are five most peculiar names, of which the Astronomer Royal mentioned three, to which I will add a doubtful Arabic name, Ras Alhague, and a very strange word indeed, which I was pleased to find really did come from America, Miaplacidus. That is an astonishing name for a star. The Astronomer Royal referred to Acrux, an Americanism for αCrucis, and that suggested to me a question which I should like to put to him.

If these stars are to have names, is it desirable that we should go to a good deal of trouble to learn Arabic names, which are of antiquarian interest rather than practical use, or would it be better to make some portmanteau words on the analogy of Acrux but with a little more regard for scholarly appearance? When there is not a respectable name for a star such as αCrucis, might not we call it Alphacruz. It can be written quickly, because one can write the Greek letter α, and it does tell one what is the name of the star used by astronomers and others. With a little ingenuity and care we might find better names for these stars than the lesser-known Arabic names. I commend this suggestion to the attention of the Astronomer Royal and the Air Ministry. There is a natural disinclination to make these portmanteau words, which suggest trade names, but it is worth considering whether something could not be done on those lines.

Mr. ARCHIBALD BLACK: Is there any possibility of our having watches graduated not in time but in arc? If that could be done, the enormous amount of interpolation that is required in the case of nearly all these Almanacs would be reduced and matters would be simplified enormously. Whether the watch would be rated in sidereal time or mean time would be a matter for those who know more about it than I do. I understand that special watches are now used which are very good time-keepers, so that presumably every navigator has to buy a special watch. I think that watch-makers would be prepared to produce such a watch as I suggest and that it is a matter which should be considered.

Squadron-Leader BARNES: In his plea for greater accuracy Captain Bennett suggested that quantities should be given to a tenth of a minute, but if we are travelling at 300 miles an hour one-tenth of a nautical mile is travelled in 1·2 seconds, so that I cannot agree with Captain Bennett.

Captain BENNETT: The whole spirit with which the Air Almanac started is shown in its introductory remarks, in which it is said that the air navigator does not work to the same accuracy as the surface navigator. At present we may not, but why add a few more miles? I asked that this question of accuracy should be considered in cases where it would not add to the work to be done.

Mr. SADLER: With regard to the accuracy of the Air Almanac, there has been confusion about the statement in the introduction to the Almanac where it is said: "provided that a maximum error of about 5 miles, in normal circumstances, is not considered important." If you read it carefully you will find that it refers not to an individual observation but to the resultant position. If

you work out the intersection of the two position lines at, say, the minimum angle of 30°, which I believe is normally adopted, you will find it requires an error of only about 1½ or 2 minutes in any interpolated quantity taken from the Air Almanac to produce the error of 5 miles. I do not think that any airman is likely to worry about that error.

Captain BENNETT: I regret to say that I am one who does.

The PRESIDENT: There is another matter to be considered, the special Tables for the rapid reduction of observations. Mr. Sadler has something to say on these new altitude-azimuth Tables.

Mr. SADLER: I did not intend to talk about these Tables, but I feel that I should say something about their general nature and why they are necessary. The Astronomer Royal has explained how from the observed altitude one may calculate a position line within an error which can normally be ignored, the error which arises from the fact that one's assumed position is not one's actual position.

There are numerous tables and methods for the solution of this particular problem, which is, in effect, merely the solution of a spherical triangle. It is essential that the process of solving this spherical triangle should be made as simple as possible, and there seems to be only one method by which this can be done. That is the complete tabulation of the solution of the spherical triangle for values, at small intervals, of the declination, the latitude, and the hour angle. The Nautical Almanac Office has recently undertaken, on behalf of the Air Ministry, to compute and publish such tables giving the computed altitude and azimuth with intervals of 1° in declination, latitude, and hour angle. The accuracy of the tabulations will be 1′ in latitude and 1° in azimuth, and I hope it will be sufficient for all navigators, with the possible exception of Captain Bennett.

The general arrangement of the tables is not of any immediate importance, since there can be many such arrangements according to the size of page adopted, but there are a few points that I should like to mention.

First of all, the declination of the stars remains constant, or practically constant, for many years, and consequently we shall be able to give separate tables for the stars, for which no interpolation for declination will be necessary for several years. We will also provide a method by which these tables can be corrected for periods when the star has moved away from its present position. Therefore, the general arrangement of the Tables will be to give tabulations for declinations from 0° to 29° and also for certain individual selected stars. The only interpolation necessary will be for the declination of the Sun, the Moon, and the planets, when a correction will have to be applied to the altitude for the odd minutes of declination of the heavenly body.

This statement is made on the assumption that the position chosen is such that the latitude and the local hour angle are both integral degrees. That involves slight difficulties of plotting on the chart, but it certainly makes the tables easier to use.

I think I have said enough to give you the general idea of these tables. We are computing them entirely *ab initio*, so that we hope they will be perfectly correct.

There have been many other tables produced to solve this problem. The Americans have recently produced what is commonly called H.O.214, to solve the problem from the point of view of surface navigation. Those tables are considerably more elaborate than the tables that we are producing, because they go to the extra accuracy of one-tenth of a minute. Unfortunately they are not as accurate as they should be, and in the new edition that has recently

been published I regret to say that, although most of the errors have been corrected, all of them have not.

I should like to say a few words about solutions based upon short methods. These short methods are dependent on the fact that the astronomical spherical triangle can be divided into two right-angled triangles in several ways. In my opinion, some of these methods are ideal for the solution of the problem, but I am used to working in an easy chair at a desk, and I am quite sure that the air navigator would not be able to make as full use of these methods as he would of straightforward altitude-azimuth tables. The altitude-azimuth tables do take up far more room. They require a large number of small volumes or a small number of large volumes, whereas the short solutions can be put into a book of a hundred pages or thereabouts. Although this is a great advantage, these solutions do involve some addition or subtraction at an intermediate stage, and possible confusion may result. For practical work, I think it is definitely preferable to have a large number of volumes than to have a short table in which it is possible to make mistakes.

Dr. L. J. COMRIE: When I was invited to come to this meeting I said that I would come as a listener and not as a speaker, but perhaps I may take up the cudgels on behalf of the shorter tables. Mr. Sadler has described a set of tables that might be regarded as ideal, in that they give the final solution of the problem. If a certain answer is a function of one variable it is very easy to tabulate, but if it is a function of two variables we must have a double-entry table and the area becomes very much greater. As soon as we have three variables, as we have in this problem, namely, the latitude, the hour angle, and the declination of the body with which we are concerned, we have to go into three dimensions, and thus get a very big table indeed. Mr. Sadler has admitted that, and I have no doubt that when he has finished his tables they will reach to a considerable height if put one on top of another. Therefore the price we have to pay for this simplification is not only what the taxpayer has to pay to produce the tables and what the individual has to pay to buy them, but also the inconvenience of a very large number of tables.

The work of finding a position line consists in making an observation, taking out data from an almanac, finding the computed altitude with an assumed position, comparing that with the observed altitude and plotting the position line. Just how long it takes to do all that I will not say within a minute or two; it may be a matter of ten minutes. The amount of time that can be saved by having a table in three dimensions is only about one minute per observation, because we must take into account the fact that one has to turn over more pages to find one's place in such a table. As soon as we take out one of those variables—in this case the declination—the table, as Mr. Sadler says, is reduced to a small one, the size of the Air Almanac.

The work is perfectly simple. As in the case of the proposed Air Ministry tables, and of many existing tables, a position is assumed such that the latitude and hour angle are integral degrees. With these one enters the table, writes down a few quantities without interpolation, adds a few more to them, also without interpolation, and then the result is the altitude and the azimuth. The process does, to my mind, fulfil the requirements laid down by Wing-Commander Mackworth, that it should be simple, uniform, and capable of being easily carried out by one whose brain is not in the best working condition.

A new set of tables of this nature is now in preparation; in fact, it is nearly printed. No originality is claimed for it, except in arrangement, accuracy, typography, and explanation. The method of solving a spherical triangle by dividing it into two right-angled triangles is well known, and various tables

based on that method are in existence. A new set appeared shortly after the War, brought out by the Japanese Admiral Ogura. Very similar tables were suggested by Smart and were produced by Smart and Shearme for the British Admiralty; similar tables were produced in France. Those and later tables all suffer from some defect of printing or arrangement; the tables now in the press contain similar figures but arranged in a different way. Those navigators and aviators who are familiar with Dreisonstok's Tables will realize the principle of the new Hughes' Tables when I say that they resemble Dreisonstok's, but, instead of having one page for one hour angle, have one page for one latitude, which is a great convenience, because in any one latitude one may make several observations at different hour angles.

My main contention therefore is based on size. Shall we have a small table and spend a very little extra time on reduction, or shall we have a large set of tables and avoid doing that extra work?

Commander van BALKOM: The short tables Mr. Comrie is working at are of course meant still more to cut down the time needed for the converting of the observations into positions. In spite of the disadvantage of their great volume I would like to report that we have found it possible to make a line of position in a time short enough to be called absolutely satisfying, using the French Almanac and J. Gingrich's tables. We found that two well-trained men could do six observations and convert the mean into a line of position by good co-operation all in five minutes' time. We find that so satisfactory that we could not see the need of the short tables, considering the before-mentioned disadvantage.

Wing-Commander MACKWORTH: I cannot agree with Dr. Comrie that a minute represents the difference in time between his method and the other in the air; it would be fair to say that it does on the ground, but I think in the air the difference in time would be more like two or three minutes. The most important point of all, I think, is the number of rules which have to be applied to all these short methods. A man perhaps is not thinking very clearly and he makes a mistake in the rule, and the answer is wrong. When we have the fully computed altitude azimuth Tables there are no rules; everything is absolutely straightforward, and the likelihood of a mistake being made disappears very largely on that account.

Dr. COMRIE: I agree that rules are a very great trouble, and I did mention that there were various defects in the short tables that had been published before. I understand that the chief reason why Wing-Commander Mackworth is opposed to the short tables is the numerous rules, and I have given careful attention to that point in preparing the tables. I hope therefore that he will at least keep an open mind and be prepared to review the situation when he finds something with very few and very simple rules.

The PRESIDENT: The discussion we have had this afternoon has been a very practical and extremely interesting one, and the various suggestions, comments, and criticisms should lead to the production of ideal Tables for use in aerial navigation. I am quite sure that the discussion will be of real value in that respect. I should like, on behalf of the Meeting, to thank the Astronomer Royal and the other speakers. We as a Society are very grateful to them.

THE TURKISH–IRANIAN BOUNDARY

IN the *Journal* for January 1938 a note was published on the Turkish–Iranian boundary which summarized the Accord of 1932 and the subsequent minor revision of May 1937. The latter dealt with the boundary in the Marbishu district, west of Urmia. Through the courtesy of the Librarian of the Foreign Office we have received a note on this portion of the boundary by the Oriental Secretary to the Legation at Tehran. This makes clear the reason for the rectification of 1937, which was not primarily an alteration in favour of one of the contracting parties, but was required by the conflict between the boundary as delimited in 1932 and the topography of the district. The cause of this confusion was a mistake in the identity of Marbishu.

The Carte Identique, drawn by British and Russian officers in the years 1849 to 1855, represents the topography correctly. The Turkish and Iranian plenipotentiaries of 1932 however used the map produced by the Four Power Commission of 1914, which made an error in nomenclature. On the Carte Identique a village, Déri, is shown lying on both sides of the stream coming from Pagi, immediately above its confluence with the Berdereche Chai. In the portion of the village on the right bank a church is prominently marked with the name Kilissa Mor Baschi. About half a mile below the confluence is the village of Avki, and farther to the east is Kilissa Mar Elena. Both of these are on the left bank of the river. Déri is an incomplete and inflected form of Deir Marbishu, *i.e.* the monastery of Marbishu; otherwise the map is accurate.

The 1914 map omitted to show any village on the Pagi stream above the confluence, gave the name Maz Bicho to the village of Avki, and transferred the name Avki to another village to the east, probably the Kilissa Mar Elena of the Carte Identique. At that time there was no reason for the Commission to be particularly interested in this district, as it was then proposed to demarcate the boundary several miles farther east.

The Turkish and Iranian plenipotentiaries in 1932, using the survey of 1914, delimited the boundary as running from Alader Dagh "towards the south-east by the crests to the summit 2400 metres north of the junction of the stream coming from Paqui with the Berdereche Tchay. Thence the line runs southwards to this junction; then it follows the thalweg of the Berdereche Tchay. . . . The localities of Eli and Paqui remain in Turkey, that of Maz Bicho in Persia."

In demarcating the boundary it would at once be obvious that these provisions were contradictory. A boundary running south to the confluence of the Paqui stream and the Berdereche Chai would place the greater part of Marbishu in Turkey. The reason for the agreement of 1937 therefore is plain. By it the boundary was amended to run from Alader Dagh "towards the south-east by the crests to the summit of Tapei Hochap, *côte* 2800, where the boundary stone No. 476 is placed, and from Tapei Hochap it runs in a straight line to the river coming from Paqui, to rejoin this at the point marked upon the attached sketch-map signed by the two parties, which is approximately 50 metres north-west of Mazbicho, and from this point it follows

the thalweg of the said river to its junction with the river Berdereche Tchay. Then it follows the thalweg of the Berdereche Tchay. . . . The localities of Eli and Paqui remain in Turkey, and that part of the locality of Maz Bicho lying east of the river coming from Paqui in Iran." It will be noticed that this agreement still uses the incorrect form Maz Bicho, instead of Marbishu.

In regard to the remarks about the various positions assigned on maps to Marbishu at the end of the previous article in the *Journal* it may be noted that the village named "Marbishu (Hider)" on sheet No. 1 C of the Survey of India Quarter-Inch map, two miles east of the confluence of the Pagi stream and the Berdereche Chai, appears to be Kilissa Mar Elena.

G. R. C.

NOTES ON THE WEIMAR PORTOLAN

HEINRICH WINTER

THE Weimar portolan, to which the date 1424 is often assigned, figures in cartographical literature as the first chart upon which the name Antilia appears. The date however has been challenged, and as no reproduction of the chart has been published, previous discussion has been rather fruitless. The chart is also of interest as being the only one which does not show the island of Brazil to the west of Ireland, and as the sole chart of Italian origin containing the legend about the Baltic which is otherwise found on Catalan charts alone. I have recently been able to remove the chart from its glass frame, to examine it carefully and to photograph it. As it has frequently been discussed, I shall limit myself to points previously overlooked.

The chart is in places very rough and cracked; it appears at one time to have been varnished, and the colours are dull. The black and the green have sunk in, and the green, which has turned brown, is scarcely distinguishable from the black. The red lines, on the other hand, have retained their colour. The red of the names, for example, Antilia, and of the islands, *e.g.* "tile," has been put on so heavily that it has in part flaked off, without leaving any trace. This makes it difficult to read some names, *e.g.* those of the Azores. In some cases however the falling away of the colour has left a white outline behind, so that the name is still legible, *e.g.* Re de rossia. In type the chart closely resembles the group to which the name Catalan has been given, based on the Atlas of 1375. The west–east course of the south coast of Norway however resembles the outline of the Dulcert chart of 1339, and other features, such as the Baltic, the north coast of Scotland tending far to the west, and the "lacus fortunatus" in Ireland, recall the Dalorto chart of 1325. Unlike most of the Catalan charts, which mark the Baltic with wave lines, the Weimar chart shows it with a solid colour, now a greenish brown. The only other map which resembles it in this is the Fredutijs chart of 1497, though this is not apparent in Jomard's reproduction.

The legend on the Baltic is now illegible, but comparison with Catalan

charts shows that it followed them: "This sea is called the sea of Germany, of Sweden, of Gotland. This sea is frozen over for six months in the year, from the middle of October to the middle of March (April), so hard that men travel over it with oxen and donkey carts, on account of the great cold of the North."

Again, as in the Fredutijs chart the islands in the Lacus fortunatus are named "sancte beate," and not "beate fortunate." No island of Brazil or of Mam appears on the Weimar chart, but the Azores are named; with the help of other charts they may be deciphered as: (corvi) marini, I conilli, San gior(gio), Isola de uentura, colonbi, Isola de bra.ill, chapraria, louo, INsule fortunate sancti brandani (the last in red characters). In the extreme west appears the Antilia group. The name Antilia is legible. The second large island has also a name, in red as is Antilia, though only the S at the beginning remains easily legible. The rest has disappeared, but some traces show that it was probably the shorter name Saluagia, not Satanaxio. Near a small sickle-shaped island are the traces of a word which may be Tanmar. North-west of Antilia is the eastern portion of another island (Royllo). On Antilia is a name which, in a photographic enlargement, appears to be Sebil (? Sibil). If this is correct, this is the sole known allusion to a Spanish city, and thus to the Spanish bishops who fled before the Moors to reach an island of the seven cities in the Ocean.

Leaving aside the "Atullia" of the Pizigani chart (a reading which is in no way certain, and which I hope to discuss at a later date) and the date 1424 assigned to the Weimar chart, Becharius in 1435 is the first to show the Azores, and it is striking that they appear within three years of their rediscovery (established from historical sources as in 1432), especially as Becharius ignores them on his chart of 1426. They are drawn by Becharius with the legend "INsulle de nouo Re(per)te," but still without any trace of the true outline of the Azores. The recollection of the legend of the seven cities had never died out, though there was no accurate idea of their position and therefore no representation on the charts. The islands (Antilia, etc.) are always placed at the same relative distance from Portugal, a distance which corresponds to 90 per cent. of the distance Portugal–Azores. Imaz considers that the rediscovery may be assigned to the year 1422. In that case, the appearance of the island Antilia on the Weimar chart is explained in the same way as on the Becharius: that is, as a result of the rediscovery of the Azores, if Humboldt's date of 1424 for the former is accepted.

This brings us to the question of the author legend on the Weimar chart. It is of course possible that Humboldt was mistaken in the date, just as he did not recognize the words "anno dñi." But otherwise his reading shows no recognizable errors, for all later doubts rest solely upon the similarity between the Weimar chart and that of Fredutijs, 1497, at Wolfenbüttel. W. Ruge, on the other hand, makes obvious mistakes. Not only did he also fail to recognize the words "anno dñi," but he inserted "de ancona," although there is no space for this after the name "hoctomanni fredutijs." There is also no evidence for his insertion of "lx" in the date. His reading is therefore not acceptable in place of that of Humboldt. After my examination, I can say that the only characters now legible are: "Contes..... conposuit ancone anno dñi mcccc..."

The name and the date cannot now be read. Both, as one frequently finds, have been deliberately removed. Between the first two legible words there is room for exactly nineteen characters: the last is apparently *s*. It will be remarked that the name "hoctomanni fredutijs" contains nineteen characters, and is the only known name of a cartographer of this length which is associated with the title "conte" and with the town of Ancona.

The date of the map has been discussed by Humboldt, Lelewel, Ruge, and others. After considering all the arguments, I have come to the conclusion that the date of 1424 which Humboldt assigned to it, when the legend was more legible than it now is, can be accepted. It has been suggested that, if Fredutijs was the author of the chart—he is known to have been active between 1497 and 1539—he drew it towards the end of the century and probably before 1497, for on his chart of that year, probably on account of the early voyages to the West Indies, he omitted the Antilia group. This brings us to the root of the matter: Was Fredutijs the draughtsman of the Weimar chart?

I cannot here go into a detailed comparison of the Weimar chart with the Fredutijs chart of 1497: the resemblances are balanced by the differences which up to the present have not been thoroughly discussed. The long legends of the 1497 chart are lacking on the Weimar chart; as are for the most part the drawings of rulers and cities. The Wolfenbüttel chart has however no Baltic legend. There are also differences in the spelling of names, though these differences are not uniform. Thus the Weimar chart has, for example, SCocia, guascongna, vischallia, Alamagna, Suria, and Kiro; the Wolfenbüttel chart: Schotia, guaschongna, viscallia, alemania, Soria, and Chairo.

Certain similarities in the script are apparent. In both the cursive *r* and the long *s* are in general lacking. On the whole however the writing on the Weimar chart tends to be angular, on the Fredutijs rounder. Similar differences may it is true be found on maps by the same cartographer, nevertheless the identity of the draughtsman of the two maps cannot be established scientifically.

To sum up my conclusions briefly: the above considerations forbid the superficial assumption that Fredutijs was the draughtsman of the Weimar chart. On the other hand, the name of Fredutijs, who was also an inhabitant of Ancona, fills in the gap in the legend as no other known name does. This point of view is new and important, but is not a reason for rejecting Humboldt's dating of the chart as 1424. We may therefore assume, until further evidence is forthcoming, that the chart is perhaps the work of an earlier member of the family, of whom nothing has been known previously.

Note: The above is a summary of a long paper by Herr Winter, which contained much detailed information in support of the points advanced therein, and which, together with the photographs, has been deposited in the Library for the information of students.—Ed. *G.J.*

A CANOE JOURNEY IN CANADIAN LABRADOR

JOHN STAINER

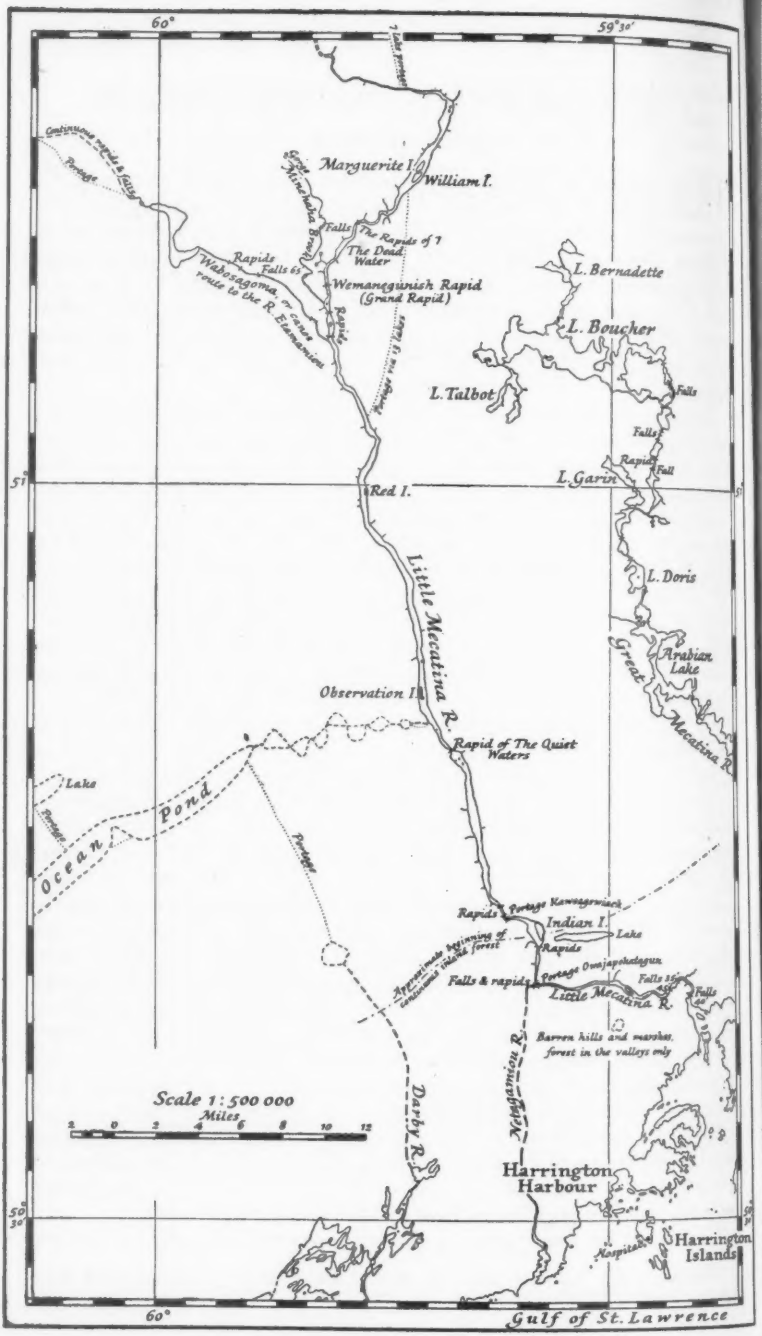
IN the summer of 1937 a small expedition, consisting of Messrs. C. C. Cholmondeley, F. J. Connell, G. F. Hanson, and myself, went up the Little Mecatina river in eastern Quebec. We left England in June and returned in October. Our objects were twofold: to canoe as far up the Little Mecatina river as possible, and to attempt to find some lake which might be used as a base for an aerial survey, an object in which we were encouraged by an Indian report of two great lakes at the sources of the river[1]; and to make a collection of birds and insects for the British Museum, of flowers for Kew, and of soil specimens for the Soil Science Laboratory at Oxford.

Hanson and I left England on June 12 by liner for Quebec; and thence travelled by coastal steamer to Harrington Harbour on the north shore of the Gulf of St. Lawrence. Harrington is a fishing village of some three hundred inhabitants on a group of islands surrounding a perfect land-locked harbour. It is the home of one of the hospitals of the International Grenfell Mission, and we are particularly grateful to Dr. Hodd, Mrs. Thompson, and the staff for their kind help and hospitality. We arrived at Harrington on June 27 and left immediately for the mouth of the river 16 miles away. The journey was made by motor boat, winding in and out of the bleak islets which stud the coast, and finally turning up the estuary into the forest. Three miles up we came to the first pair of parallel falls, between 40 and 50 feet in height; an enormous quantity of water was coming down, still a result of the snow floods, and between June 27 and September 15 the river at the mouth fell approximately 25 feet.

Salmon are unable to ascend the river-mouth falls, but they come right up to them, and several fishermen lay their nets in the estuary. From one of these we were able to obtain valuable information as to the position of the important portages on the river. He told us that at the "Grand Rapid," he and his three brothers used to leave the river by a portage on the east bank which took them 5 miles across to a chain of thirteen lakes, and so back to the river above the rapids. A few miles farther on they had their hut below another set of rapids, where the river entered "impassable mountains," but about a mile below the hut there was a chain of seven lakes on the east bank, which circumvented these second rapids. He had never heard of any one travelling more than a few miles farther than this. On our return to Harrington in September we were also told that 1½ miles above the Rapid of the Quiet Waters there was a fifteen-minute portage on the west bank (marked by a hut at the entrance of a stream), which led to a chain of seven lakes coming out at Ocean Pond, a narrow lake about 18 miles long, running in a NE.–SW. direction. Ocean Pond, which is a trapping centre well known locally, could also be reached by a 7-mile portage from a lake at the top of the Darby river. There was another large lake north-west of Ocean Pond, reached by a portage from it.

On July 13 we were joined by Cholmondeley and Connell, and set out

[1] Rouillard, E., 'La côte nord du Saint-Laurent et le Labrador Canadien.' Quebec, 1908.



Little Mecatina river, Eastern Quebec

inland. There were two further sets of parallel falls round which we had to portage in the first 6 miles. Along the edge of the river was a zone of entangled willow and alder; behind these, thick spruce forest; and, finally, over the top an occasional bare peak. In many places the forest was replaced away from the river by muskeg. Twenty miles inland however all barren hills and muskeg were replaced by thick spruce forest; cliff scars alone provided bare patches as a relief to the endless green. On the other hand, two airmen who, late in September, turned back owing to bad weather when attempting to fly from North West River to Severn Islands Bay, told us that the height of land was largely muskeg, rising to about 4000 feet.

For the first 16 miles we had been travelling up only half of the river. The Little Mecatina inland is often as much as three-quarters of a mile wide, but 16 miles from the coast, in a region of high rocky hills, it narrows down to a 400-yard rapid scarcely 100 yards wide, and, still farther, goes over a fall of about 45 feet into a great whirlpool. This whirlpool then splits into two against the rock walls, the Little Mecatina flowing east, and the Netagamiou flowing west and then south to the sea. Both flow out of the whirlpool over waterfalls and rapids; the total rise over the portage measured by aneroid came to 100 feet. It was a few miles above this that, going through a narrow gorge, one of our canoes was upset in a deep rapid. In rescuing the occupants and the canoe we were obliged to let some of our things go, and for the remainder of the journey had to do without medical stores, and with only one two-man tent between the four of us. We had also lost a camera and a number of films, and all our bird-skinning apparatus. This last was our greatest loss, as without arsenical soap we were unable to keep any bird skins successfully. Luckily we never needed our medical stores, and once the fly season was over the loss of the second tent was no great nuisance.

We made a dump of stores below the rapid, and continued north on July 26. Portages were becoming less numerous, and we had three successive strips of 5, 8, and 22 miles' clear paddling. There was a portage of $1\frac{3}{4}$ miles between the first two, but of only about 10 yards between the second and third. Having passed the coastal hills the country was at first flat, but up the 22-mile stretch the hills grew steadily higher, until at the rapids at its end they stood some 800 feet above the river, and about 1500 feet above the sea. This was about 55 miles from the coast.

The flowers we had seen early on by the river-side had included the Labrador iris, harebells, and midget white violet; while on the marshes were bakeapple, pitcher plant, Labrador tea, and occasional groups of blueberry. As we passed upstream these were replaced by groups of golden rod and Michaelmas daisy. The insect life was varied; blackfly and mosquitoes necessitated the use of dope and occasionally of nets until the beginning of August, when, with the cooler nights, they began to thin out. Horsefly (*Chrysops excitans*, Walk) were abundant until the end of July. A collection of aquatic coleoptera made from the ponds on the barrens close to the junction included six species, all of which proved to be generally distributed over eastern Canada. Eight further species, found in the river and its tributaries on the 22-mile stretch and above, had a similar distribution. The collection of terrestrial coleoptera is not yet fully identified. Butterflies were not uncommon, though the variety

of species was small, and we saw few moths away from the barrens. Dragon-flies, caddis flies, and other water insects formed the greater proportion of the insects seen.

Above the 22-mile stretch was a long series of rapids, called Wemanegunish on the map, which were evidently identical with the Grand Rapids of which the trappers had spoken. The forest on both banks was extremely thick, and after three days' search we were still unable to find the 5-miles portage. Our time was running short, and we decided to alter our plan. We heard subsequently that the portage actually left the river nearly 4 miles below the rapid; if we had searched another mile down we might have found it. Just above the small rapid which heralded the approach to Wemanegunish there was a small tributary on the west bank, coming in by a series of falls and rapids; while $2^1/_2$ miles below there was a second west bank tributary, the entrance of which was marked on the map and labelled as the Wabosagoma, or canoe route to the river Etamamiou. We accordingly decided to split the party, Connell and Hanson trekking up the former tributary, and Cholmondeley and I taking a canoe up the latter.

After a preliminary two days' reconnaissance, in case it should be possible to take a canoe, Connell and Hanson set off up their tributary on August 9, taking rations to last them a fortnight. The temperature of the water was unexpectedly high, and they were expecting to come either to a lake or a long stretch of marsh before very far. They were however to be disappointed; the river was one long line of rapids and falls; near its mouth it averaged 100 feet in width and about 8 inches in depth, but farther up its depth was often 3 feet or more. The forest was the thickest they had yet met, and the entangled mass of fallen timber, often 5 feet in depth, which lay beneath the trees made it necessary to wade up the river if any progress was to be made. Five miles up they came to a series of falls, 20 feet, 16 feet, 10 feet, and 120 feet in height, all joined together by rocky basins, in the space of one mile. Above the falls the river ran into deep water scattered with slabs of rock 10 feet square on top, just too far from each other to make progress possible by jumping. They were reduced to going through the forest past frequent cliffs and landslides, and their average daily march came to $1^1/_2$ miles. Finally, further progress became a matter for a rock-climber, and they turned back. They estimated that in a distance of 10 miles the river had risen 1500 feet, making their farthest point approximately 2300 feet above sea-level at a distance by river of 65 miles from the coast. The river at this point was again turning into a line of hills, and judging by the volume and warmth of the water there must have been a large lake or other major source of supply within a short distance.

Meanwhile Cholmondeley and I had started up the Wabosagoma. The entrance is easily found, being marked by a small marsh on the west bank. The stream was not more than 30 feet wide at first, winding in oxbow bends through the forest. Here, as elsewhere, we had difficulty with our compasses, owing to the presence of magnetic iron ore. Four miles in, a small rapid has a portage track on the left bank, but here and at a second rapid immediately following the first we were able to haul the empty canoe up the river. Seven miles in we came to rapids and falls of 65 feet, with a 2-mile portage round;

J. S.

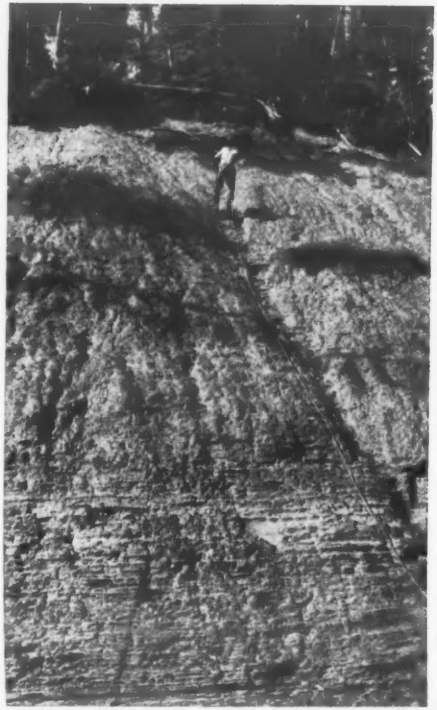
Falls at the junction of the Little Mecatina and the Netagamiou

J. S.

The lakes on the Wabosagoma

J. S.

A rapid on the Wabosagoma

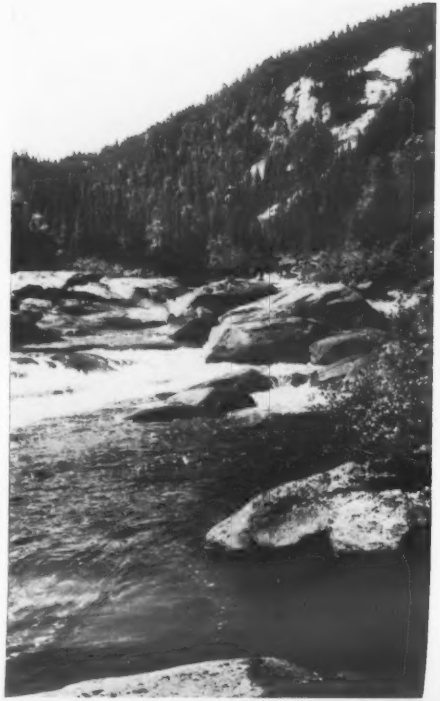


J. S.

Clay bank, below the Grand Rapid, from which the podsol specimens were taken

G. F. H.

Minehaha brook



G. F. H.

Farthest point reached on the Minehaha brook

as at most of the longer portages, the track climbed to the high ground by a very direct route, remarkably straight. These portages however, mostly of Indian origin, are made for one-man canoes, and our 18-foot two-man canoes could seldom be got through without additional cutting. We used South American *machetes* for this, and found them excellent for removing the soft-wooded spruce saplings. Most of the forest was black spruce, with an occasional red mountain spruce standing out above, one or two larch in marshy places, and irregular groups of birch.

Above these falls the river widened out; it became slow and muddy with groups of yellow water lilies, and numerous trout. Trout had been remarkably absent from the main river, which may possibly be due to the shifting sands and absence of weed. At one place we came on the nest of a pair of ospreys, the second we had found, built at the top of a dead spruce. Other birds we recognized included American bittern, yellow-legs, various species of sand-piper, and red-breasted nuthatch. There were many we were unable to identify. Amongst game birds we twice put up spruce partridge, and on one or two occasions saw duck, but it would have been impossible to rely on finding game. The next 5 miles was steady paddling with an occasional small rapid, up which we could usually haul the canoe; then the river began to widen and, after a straight, still stretch of over a mile, we came to the first of two lakes, roughly triangular in shape. The first had a base of about 2 miles, and a maximum dimension of about 3; and the second was somewhat larger, and joined to the first by a very shallow channel some 500 yards long. On either of these it would have been possible to land a seaplane, though the water close to the shore was not deep. As with each piece of big water we met, each of these lakes was occupied by a pair of loon; we never saw these birds away from lakes except when occasionally they flew high over the river, calling as they went. Judging by the number we heard, we must have failed to find many lakes for every one we discovered.

The second lake appeared to have two possible inlets. One however consisted of such frigidly cold water that we abandoned it straight away as coming from a spring source. The other led through a chain of small reedy ponds, and one small rapid to a portage which on investigation proved to go W.N.W. for a distance of approximately 6 miles. The track was in bad condition, evidently having been opened during the previous winter after many years of disuse, probably by the trapper whose shelters and traps we had found all round the lakes. Since then a gale had brought down many trees over the tracks, and the clearing necessary to get our canoe through was out of the question in the time at our disposal. We accordingly returned to a collecting camp on the lakes.

On August 19 our two parties joined up below the Grand Rapid, camping on the shore below a clay bank, 150 feet in height, up which we had a rope line into the forest. Soil specimens taken from this bank showed it to consist of a podsol remarkable for the fineness and purity of its clay. The rocks of the lower parts of the rapid were biotite gneisses and schists, with veins of orthoclase. We saw many animals on our downward journey; porcupine, which had previously been unseen, had to cross long flats to reach the water, and both they and their tracks were frequent. Caribou were heard several

Farthest point reached on the Minehaha brook G. F. H.

Minehaha brook G. F. H.

Clay bank, below the Grand Rapid, from which the podsol specimens were taken J. S.

times; and the tracks of fur-bearing animals were everywhere. We spent a week collecting at the Grand Rapid, and then returned speedily to the dump, where we spent a further period collecting. It was while wandering over the barrens east of the river that we found a deep lake, running east to west, 2 miles long and about half a mile wide, hidden by the trees, scarcely half a mile from the river, and unmarked on the map. The barren hills evidently stretch from the sea inland for about 15 miles, and from our highest viewpoints could be seen east and west as far as the eye could reach, the forest only reappearing in sheltered dips and valleys. There are frequent small tarns and probably further hidden lakes.

On September 15 we returned to the coast, and Harrington.

THE EARLIEST KNOWN MAPS OF KENT

EARLY KENT MAPS (SIXTEENTH CENTURY). By GREVILE M. LIVETT. Reprinted from *Archaeologia Cantiana*, vol. XLIX, 1937 [1938]. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; pages* 247–277*; maps in facsimile*

IN the increasing interest in early county maps Kent has naturally come in for a good deal of attention, for it was one of the first counties to be taken in hand by Elizabethan topographers—particularly Lambarde and Symonson, whose work takes an outstanding position in the general story. Symonson's fine map has been made available by the Ordnance Survey by the reproduction of a seventeenth-century issue, while the unique original specimen of its eastern half, owned by the author of the present memoir, was included in this Society's recent set of reproductions. Attention has been called also to the smaller anonymous map, of the first issue of which the only known copy was acquired by the Society only a few years ago, and which suggested to Mr. E. G. Box the theory that it was the "Carde of this Shyre" spoken of by Lambarde in his 'Perambulation,' written in 1570. Two other important documents are now owned by the Kent Archaeological Society, namely the original MS. draft of Lambarde's work and a copy of the same by the Somerset Herald Robert Glover, who added thereto a map in his autograph drawn probably not much later than 1571. With Saxton's well-known map of the four south-eastern counties we have therefore four separate representations of Kent from before 1600, and the main facts about them have been brought together and judiciously discussed by Canon Livett, a service for which we may be grateful, particularly as he gives us for the first time a collotype reproduction of Glover's map, probably the first of the series. As each of the four maps has at one time or another been identified as that referred to by Lambarde, Canon Livett makes this question his central theme, and he will no doubt carry most of his readers with him in his rejection of all four as having been in Lambarde's mind in 1570.

As Glover's work in this connection has been hitherto known to a few specialists only, some details about the man and his map may be quoted from Canon Livett's account. Born in 1543, he was the son of a Kentish man, Thomas Glover, of Ashford, and he married a daughter of William Flower, Norroy King of Arms. He devoted himself to antiquarian and topographical research and, entering the College of Arms in 1568, became Somerset Herald in

1571. His copy of Lambarde's text is a fine piece of calligraphy, and the map too is very neatly drawn. The main features are shown in different colours, and the hills are represented by the usual lines of mounds. A rectangular grid with 2-mile intervals is faintly visible, but as there is no marginal numeration its purpose was more probably to facilitate reduction from an original draft than to serve as a means of indexing as in Norden's maps, where the interval was the same. The topography is far from accurate, mistakes occurring both in the courses of the rivers and the trend of the hill-ranges. Any possible claim to be Lambarde's "Carde" is negatived by its failure to show the name Medway in the position required by his reference in 1570, and by the fact that Glover signs as "Somerset," a position which he attained only in 1571.

Next in order comes Saxton's map of the four south-eastern counties (1575), on which, and on Saxton's work as a whole, Canon Livett enters into details which need not be repeated here. The third is the anonymous map, found in several copies of Lambarde's work, but almost certainly not originally destined for such a position. Mr. Box founded his theory almost entirely on the occurrence of the name Medway in the required position below Maidstone, but this is surely insufficient to establish such a positive conclusion. In conjunction with the close likeness to the Kent portion of Saxton's map, this theory led him to postulate a survey of the county by the latter in or before 1570, and an arrangement with Lambarde for its use by him, for which, as Canon Livett justly says, there is no valid ground at all. But a comparison with the map of 1575 leaves one with hardly a doubt that this was the actual model from which it was copied, the resemblance being not merely to the topography and its manner of showing, but even to the script, spellings, and ornamental border. Moreover, apart from certain omissions and improvements (the latter in themselves an argument for its later date) its content is just such as would be given were a rectangle drawn round the Kent portion of Saxton's map, even the details for the included parts of neighbouring counties being reproduced. The style however seems inferior to that of Saxton's engraver Hogenberg, as is brought out by Canon Livett's enlarged facsimiles of portions of the two maps, and we may accept the view that it was probably the work of another hand, possibly another of Saxton's staff of engravers, for there are likenesses to some of the unsigned maps in his Atlas. Canon Livett believes that it was actually brought out by Saxton in response to a special demand for county maps which (as Mr. Lynam has suggested) may have been stimulated by the publication of Holinshed's 'Chronicles' in 1578. This must remain little more than a speculation, but in any case, if copied from the map of 1575, it also cannot have been Lambarde's "Carde" of 1570.

The last map to be considered is Symonson's of 1596, which since the discovery of Lambarde's original draft of the 'Perambulation' must of course be quite out of the running. The chief point at issue about this map has been its original date, which the late Mr. Hannen (following an earlier writer) thought to have been 1576. This he supposed to be traceable, almost entirely erased, in the margin of the map. But, as already pointed out elsewhere, the erased date is almost certainly also 1596, the alteration being merely for the purpose of improving the balance of the inscription. This receives full support both from the facsimile supplied of the portion of the map in question, and from the similar erasure of an original inscription on Saxton's south-eastern counties, also reproduced in facsimile. The fact that Lambarde referred to Symonson's map in his second edition only (1596) is also against the date 1576. As to the map itself, one or two points are worth noting. In listing the several re-issues, Canon Livett gives good reasons for putting the first and second rather earlier

than had been thought likely by the present reviewer; and he points out that Symonson, alone of the four authors, marks the short underground course of the Loose stream near the Boughton quarries.

As the four maps here discussed are the only maps of Kent from before 1600 at present known, and none fulfils the condition requisite for identification with Lambarde's "Carde," we cannot escape the conclusion that in or before 1570 he had seen a map of the county which has since disappeared, and the possibility that a copy may yet come to light should be borne in mind by workers among old records. And it is not the only early map of Kent that has been lost to sight, for it is to be remembered that the county was one of those surveyed by John Norden, and there is good reason to suppose that his map was actually published; for besides his other county maps, used by Camden for the 'Britannia,' of which published originals are now known, the Kent in that work is similarly credited to Norden, and it is hardly likely that it alone was based on an unpublished MS.

On one or two minor points, not affecting the main argument, Canon Livett seems to have been misled by faulty information. Thus he repeats the mistake, which has somehow gained currency, that Mercator's British Isles of 1564 is a MS. map. (Besides the Breslau engraved copy, two others have lately been brought to light in Italy.) He speaks too of Norden's county maps as "made ... for publication . . . in Camden's *Britannia*" (for which they were merely copied), while he seems to know of the "Quartermaster's" map of 1644 only through Rocque's re-issue in the eighteenth century. But on matters specially concerned with Kent, such as past changes in the region of the Wantsum, incidentally spoken of, he shows the competence to be expected from a former editor of the *Archaeologia Cantiana*. The facsimiles of the four maps are useful for comparison, though the fourth is on a much reduced scale. E. H.

REVIEWS

EUROPE

THE LAKELAND LANDSCAPE. By GEOFFREY CLARK and W. HARDING THOMPSON. (The County Landscapes.) *London: Adam and Charles Black*, 1938. 8×5 *inches;* xii+136 *pages; illustrations and maps.* 7*s* 6*d*

The publishers announce this as a new book on the English Lakes on an entirely original plan, with a new type of map showing the distribution and nature of landscape beauty in the Lake District. The authors state in their introduction that they have tried "to present an outline picture of the Lake District as a whole, coinciding roughly with the region which has every natural asset to qualify it for protection as a great National Park and within which local occupations may be maintained and encouraged." There is no attempt to make it an accurate guide-book with minute directions as to route and distance. Thus it cannot compete with Baddeley who was the best guide, philosopher, and friend that the tourist ever had. It is uncertain how far it will appeal to those who know the district thoroughly and who love to browse once more over their favourite expeditions. But the facilities of public and private travel have thrown this district open to increasing hosts of visitors who will find here a useful summary of what is best worth their attention. One chapter called the "Heart of the Lake District," deals with the tops of the fells and describes the best rambles and view-points. Here the authors are evidently in their element and the writing is vigorous, straightforward, and adequate. There is much wisdom in the final chapter on the local building tradition, and there is warm praise for the beauty of Hawkeshead.

The book is dedicated to all those who have worked to protect the beauty of the English Lake District and the enthusiasm of the authors for this chosen land is admirable. A few careless constructions, one or two inappropriate words or phrases, and the excessive use of the word "climax" slightly detract from the pleasure of the reader. The authors give a few pages on the geological evolution of the scenery, which may be useful to those who wish to understand the build of the country. It is however misleading to a beginner to describe Great Mell and Little Mell Fells as limestone hills. Their Basement Conglomerate material gives them an appearance very different from that of a typical limestone mountain. Nor is it helpful to refer to "Magnesium Limestone" in connection with Cheddar and Wookey. Although other limestones are liable to be dolomitized in places, yet the Magnesian Limestone is of Permian age and the Mendips belong to the Carboniferous Limestone series.

The beauty of the district leads the authors to do their utmost for the National Trust and for the Friends of the Lake District. No piece of country will save itself. Its inhabitants, from professional men through tradesmen to manual workers, are all interested in its development. The saving must be done by outside and larger powers, whether governmental or financial, which are inspired by wider and less parochial views. Consequently any book which advocates such a sensible interest in the Lake District and such a warm appreciation of its beauty is likely to have a beneficial effect upon those readers who have not yet been awakened to these questions. The deeds of the Forestry Commission at Whinlatter and the accomplishments of Manchester in the Thirlmere and Haweswater valleys are duly lamented. Long ago W. G. Collingwood pointed out the inevitable result if the Lake District attempted to combine the provision of beauty with the supply of water. Perhaps the aspect of the Mardale question

which is most pathetic is the thought of the long tradition of valley life swept out of existence.

The landscape map is a pleasure to look at. It is not overcrowded, and the colour scheme brings out clearly and distinctly the salient points with which the authors deal. There are sixteen plates, and these form a pleasant representation of typical scenes. One which shows the head of Buttermere might be more helpfully labelled "Buttermere and Haystacks" rather than "Buttermere and High Crag." The authors describe Ennerdale as having the huge mass of Great Gable as its focal point, but Pillar is the mountain which dominates the greater part of this valley. T. H.

WELSH BORDER COUNTRY. By P. THORESBY JONES. *London: B. T. Batsford*, 1938. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* viii + 120 *pages; illustrations and sketch-map.* 7*s* 6*d*

Much of the charm of the Welsh Border country undoubtedly derives from its turbulent history, to which its castles, its manors, and its churches bear witness; to these Mr. Thoresby Jones is a competent and interesting guide. These gems of architecture, feudal, ecclesiastical, and domestic, are set among valleys and hills still unspoiled and undisturbed; something of their beauty is caught in the well-chosen illustrations with which the book is so lavishly endowed. The author tells us clearly and simply where the best is to be seen and how to find the place from which to see it; for he knows his country well and speaks with the authority of first-hand acquaintance even with the least accessible parts. It is a pity however that the "personality," for want of a better word, of this highly individual region completely eludes the author and that its geography, in the scientific and analytical sense, remains untouched to the end. The Border country is a land of farm, wood, and moor, Britain at its most rural; yet of the pattern of this rural life he tells us nothing. Perhaps it is this inability to penetrate beneath the surface and beyond the externals of architecture and topography that make him so scornful of the novelist of country life. The description takes the form of a number of journeys, on foot or bicycle, starting in the Black Mountains, working north to Chester, and then returning south to the Wye valley. There is a useful index and the end papers are maps, which however are of no use except to show the position of places mentioned in the text. A. A. M.

GUIDE TO BELGIUM AND LUXEMBOURG. Twelfth edition. Entirely new work. Edited by T. G. BARMAN and J. DE GEYNST. *London: Thos. Cook & Son*, 1938. $7 \times 4\frac{1}{2}$ *inches;* 196 *pages; maps and plans.* 5*s*

The latest edition of the guide to Belgium and Luxembourg is mainly occupied with the former of these two countries. It is a model of compression and contains a remarkable amount of information. Although much less bulky than other standard guides, it has been possible to use print that is easily readable. There are three maps, taking in Belgium and Luxembourg, the Belgian coast, and the Ardennes; and eight plans. The general map on a scale of 1/M will be of particular use to motorists: the roads are classified and distances given, in kilometres. More precise information as to the difference in surfacing between first and second class roads would however be welcome.

EVERYBODY'S PARIS. By JOHN BRANGWYN. *London: Methuen & Co.*, 1938. $7\frac{1}{2} \times 5$ *inches;* x + 312 *pages; illustrations and plan.* 7*s* 6*d*

Mr. Brangwyn's object is to portray "something other than tourist Paris," and for this task he is well equipped by his knowledge of a city in which he has long

resided. He deals with the life of Paris not street by street, but in a series of chapters on its different aspects: the port of Paris, the administration of the city, the industrial suburbs, libraries, museums, etc. The scheme is sound and the book may possibly be of use if read after Paul Cohen-Portheim's 'Spirit of Paris' and taken in conjunction with an efficient guide-book. It contains a large number of facts and statistics, accurate in themselves and industriously compiled, but rather scrappily put together and not accessible enough (despite a useful index) for it to be considered as a guide-book, for which category its bulk and lack of maps would perhaps in any case disqualify it. Most readers will be content to dip into it occasionally, and they will be left to draw their own conclusions, for the book lacks a general inspiration. To many it will suggest the unbrokenness of tradition in French commerce and industry despite the series of political revolutions. J. P. H. M.

GEOGRAPHIE DER SCHWEIZ. By J. Früh. Herausgegeben mit Unterstützung der Schweiz. Eidgenossenschaft durch den Verband der Schweiz. Geographischen Gesellschaften. Erster Band: Natur des Landes. 1930. 612 *pages*. Zweiter Band: Volk, Wirtschaft, Siedlung, Staat. 1932. 806 *pages*. Dritter Band: Die Einzellandschaften der Schweiz. 1938. 720 *pages*. *St. Gallen: Zollikofer & Co.* $10\frac{1}{2} \times 7$ *inches; illustrations and maps*

In 1930 the first published pages of this Geography of Switzerland, issued modestly in paper-covered parts, were reviewed in the *Journal* (75 (1930) 179), and adjudged a promising beginning. In succeeding years fresh parts appeared, to confirm the original estimate, and to show that the work had been planned on a grand scale. Now, with the issue of the thirteenth and last part, and bound into three massive volumes, the whole stands complete, save for an index volume to be compiled in the near future. The veteran author is to be congratulated, the more so because the greater part of this immense literary labour has been accomplished since retirement from his chair at Zürich.

The two outstanding qualities of the work are comprehensiveness and a strictly scientific method. Like the similar work on the Eastern Alps by Krebs, the country is first treated as a whole, both as to physical and human geography, and then, in the third volume, regional geography is dealt with in detail. If further conviction on this point is needed, then let the minutely subdivided contents pages be consulted. And there can equally be no doubt as to the strictly scientific temper of the author's mind. He eschews theories of every kind, historical or geological, and never generalizes without sufficient data. For glib and airy writing Professor Früh has no taste; his pages bristle with diagrams, maps, statistics, tables, and proper names. At the head of a chapter in the first volume he significantly quotes Goethe to the effect that the limitless variety of statistical knowledge in relation to the inequalities of the earth's surface is "the goal of geographical teaching"; and he has evidently been inspired by the same aim.

It is rather difficult in a brief review to single out particular chapters or sections for comment. If attention be restricted to altogether outstanding aspects of geography, then in the first volume the pages on land-forms must be considered, which, quite properly, are accorded substantial treatment in the "Natur des Landes." The spectacular findings of Alpine geologists are concisely summarized: the slow assembly of the alpine edifice and the carving out of the present land forms by the agents of erosion are portrayed in turn. That the form of alpine valleys arises from normal erosion plus glacial action is taken as axiomatic; but the subject of glaciology is treated rather disproportionately, and evidence of the probable evolution of alpine valleys through successive cycles,

and the development of the river pattern, are somewhat glossed over. (But there is a photograph of the Bedretto terrace, and a note on this and similar features.) A little later there is a further slight lack of balance in the extended treatment accorded to avalanches, land-slips, etc., and the brevity of the paragraphs on accumulation forms such as fans, alluvial terraces, and alluvial plains, which are often supremely important to agriculture and settlement. The influence of what may be termed the geological tradition in the study of relief is discernible, which is not quite the same thing as the pure study of land-forms, or the study of land-forms to bring to light those qualities and characteristics affecting the human occupation. Only the last two methods of approach may be deemed truly geographical. But to mention these points is not to stigmatize these chapters as in any way deficient. It is inevitable that a compendium should reflect the trend of past research; and the most brilliant triumphs of earth-science in Switzerland are in tectonics and glaciology. Moreover, the characteristically painstaking devotion to minute detail frequently opens fresh vistas to the reader well versed in Alpine geography. There is for example (pp. 193–4) a quite brief treatment of Alpine passes, which distinguishes several types (normal cols, ice-sharpened cols, wind-gaps, ice-modified wind-gaps, etc.), and is most illuminating; whilst on neighbouring pages there are some very suggestive paragraphs on the relation of rock types to mountain relief. One other outstanding feature of the first volume should be mentioned. The numerous Swiss lakes are accorded exhaustive treatment, extending in certain instances (Lucerne and Geneva) to several pages of text and diagrams.

The second volume is an equally impressive display of garnered knowledge. Agriculture, industry, settlement, population, trade, and the development of the State are all considered at length. The section on house types imparts especial pleasure by reason of a series of excellent photographs; and the maps accompanying the chapter on settlement and population are also worthy of great praise. The reviewer was a little disappointed in the chapters on trade and transport, for space is devoted to the engineering of alpine roads and railways, rather than to traffic; but he confesses to finding therein a stimulus to map studies of alpine communications. There is one general criticism of this volume, and the only one of its kind that can be levelled against the whole work. It is in the sphere of general human geography that the weakness of an encyclopaedic method shows itself. There is a careful presentation of facts relating to every branch of Swiss industry, of important crops and farm animals; there is even a lengthy account of the minerals of Switzerland, which are either worked out or economically insignificant. But the complexity of the subject-matter, especially if treated historically, demands broader, more synthetic treatment. After all, in Switzerland at least three fundamental rural economies (Germanic, Alpine, and Roman) meet; and it has been a European crossroads for millenia. Devotion to pigeon-holed detail deprives us of thorough-going treatment of the alpine economy, of the development of the Swiss national economy, and kindred subjects. It is a great pity the brief accounts of such topics could not have been extended, and the minor details of agriculture and industry relegated to the third volume.

But on the other hand the third volume is a triumph of the method that disappoints in the second. The three great geographical regions of the country are most minutely described; every valley, town and district is reviewed in turn with a wealth of detail, photographs, numerous plans, and reproductions of official maps. So far as existing knowledge allows, it is only necessary to consult the index to have available the local geography of any place or district in Switzerland.

It is to be hoped that all students of geography will make good use of Professor Früh's great contribution to geographical literature. J. H. G. L.

SWITZERLAND, together with Chamonix and the Italian Lakes. Handbook for travellers. By KARL BAEDEKER. *Leipzig: Karl Baedeker—London: George Allen and Unwin*, 1938 (28th *edition*). $6\frac{1}{2} \times 4$ *inches;* lviii + 600 *pages; maps and plans.* 15*s*

Baedeker's Swiss guide-book combines age and youth in the most felicitous manner, for notwithstanding its approaching century (it was first published in 1844), the book in its 28th English edition is so up to date as to speak of "Germany (including Austria)," and no longer of the "Deutsch-Österreichischer Alpenverein." So far, the only event by which the book has been overtaken is the recently imposed necessity of visas for British visitors to Germany. The information that it contains and the way it is marshalled is truly astounding. The reviewer has found but three matters for comment. On the map facing p. 472 the road from Celerina to St. Moritz is shown passing under instead of over the railway. Davos-Dorf is said to be "entirely modern, except for the church of St. Theodor." So indeed it might appear, but Jürg Jenatsch's house, built about 1630 and bearing his arms and those of Anna von Buol his wife, still stands (the Villa Veccia), and the reviewer's house was built in 1665. Of Mont Blanc it is said, quite correctly, that it was ascended by de Saussure in 1787 and by Clarke and Sherwill in 1825. But why the latter should have been singled out for mention is not clear, for their ascent was the fourteenth and the mountain had by then been ascended five times by British parties and once by Americans. Here and there the English is a trifle continental: the view from the Parsenn railway becomes "ever more unrestricted."

Special mention should be made of the road-map with which this edition is provided; this will certainly be most useful to motorists. On the other hand, the 1 : 100,000 map of the Rigi, and the 1 : 500,000 map of the Engadine and Val Tellina of previous editions have been omitted. The southern portion of the valley of Poschiavo is now unprovided with a large-scale map.

Baedeker is of course not the only Swiss guide-book and cannot compete with specialized mountaineering guides or historical guides. But for minute practical details to be used by most ordinary people, Baedeker is, as Coolidge said fifty years ago, unsurpassed. G. R. DE B.

LET'S GO TO BAVARIA: a traveller's companion. By MICHAEL SUTTON. *London: Frederick Muller*, 1938. 7×4 *inches;* 176 *pages; illustrations and railway-map.* 5*s*

This is a brief but attractive guide to the better-known districts of Bavaria. The author knows his subject well and writes entertainingly of Augsburg, Rothenburg, Nürnberg, Dinkelsbühl, München, and the Bavarian Alps. But Bamberg with its lovely cathedral is dismissed in half a page, and there is no mention of Franconian Switzerland. Writers of modern guide-books still speak of Nürnberg only as a city of the past. Mr. Sutton says nothing to suggest that Nürnberg is still intensely alive, and that this old imperial city, the home of arts and crafts, the courted ally and dreaded rival of emperors and kings, seems destined to play an all-important part in the development of modern Germany. Visitors who go there to-day merely to be transported back into the Middle Ages, or expecting to hear only "the metallic tramp of a company of tin soldiers" through its cobbled streets, are likely to be disappointed. M. L.

THE NORTHERN COUNTRIES IN WORLD ECONOMY. Denmark—Finland—Iceland—Norway—Sweden. Published by the Delegations for the Promotion of Economic Co-operation between the Northern Countries. *Otava (Finland): Otava Printing Office*, 1937. 9×6 *inches; 238 pages; illustrations and sketch-map*

As the preface shows, the work was compiled by an editorial committee drawn from the trade departments of the five countries: Denmark, Finland, Iceland, Norway, and Sweden. A general survey of the joint economic life attained will, it is believed, not only promote further co-operation between the countries themselves, but also render the world at large fully cognizant of the important status which they have, by mutual efforts, established.

The first eight chapters provide a brief summary of each country's general characteristics and special attributes, particularly of those which render it adaptable for combination in a general economic policy. The occupations and industries then described, although their several importance in the different countries varies greatly, are seen to agree in kind, deriving either from the soil and surrounding seas or from the geological composition. The present position of each industry, both as regards its value to each country and collectively, is then given.

The contribution of each country as economic producer having been established, we realize that, whereas a certain number of commodities such as timber and agricultural produce are available in quantities far greater than are required for home consumption, in other vital commodities the countries are wholly or mainly lacking. The five countries thus collectively figure both as ample producers and ready consumers. Chapters VIII and IX work out the details of this position very carefully, all the necessary data being supplied by the statistical tables at the end of the book. We are thus able to see at a glance how, by means of co-operation, so strong a position has been attained and what a vast bulk of trade, both as regards export and import, is involved.

The account of the shipping industry in Chapter X concludes by showing that the Northern countries constitute as much as 11 per cent. of the world tonnage, being surpassed only by the United States and the United Kingdom. Chapter XI attributes to the remarkable and rapid improvement in communications in recent years not only the establishment of more intimate relations between the countries themselves, but also the increase in the tourist industry.

Chapter XII is called "International balance," and gives a good general idea of the economic position. The commercial policy outlined in Chapter XIII shows a strong combined effort on the part of these countries to promote principles laid down by the League of Nations as a guide to a policy in international trade. A system of freer trade has been established by the Oslo Convention, in which the Northern countries, together with Belgium, Holland, and Luxembourg, take part. A plan of mutual assistance has thus gradually grown up, so that, in spite of their comparatively low population, these countries, in 1936, accounted for 5 per cent. of world trade, thus taking, in this respect, a fifth place among the nations of the world.

The last chapter shows how the firmly established co-operation between the Northern countries has now invaded practically every sphere of national life. Each is independent as regards its policy of capital and currency, each has its individual industries and trades, but wherever co-operation is possible, it has become the watchword, in the hope that by means of peaceful collaboration greater results may be attained.

One hesitates to criticize such a well-executed and satisfying piece of work, for the treatment is clear in spite of the fact that the idiom is not English. Some

of the words however are wrongly applied, and any misuse of technical or chemical terms should have been avoided. As a work of reference, the book could be rendered more valuable if a list of the more important sources of information and an index were appended. E. G. W.

ASIA

PALESTINE OF THE CRUSADES: a map of the country on scale 1 : 350,000. With Historical Introduction and Gazetteer (42 pages and 2 plans). *Survey of Palestine. Size of map* $30\frac{1}{2} \times 21\frac{1}{2}$ *inches* (*folded in paper cover,* $8 \times 6\frac{1}{2}$ *inches*). 250 *mils.*

The Survey of Palestine in producing their map of the crusading Kingdom have performed a great service to mediaeval studies, and the work, when it is associated with the names of Mr. C. N. Johns, who writes the gazetteer, and of Father Abel, whose advice is acknowledged on the map, can have high claims to authority. Crusading nomenclature, with its fluctuations between Latin, Norman French, and Arabic forms, is a perpetual problem, and in this respect Mr. Johns' gazetteer is of particular value. His notes provide information also as to the existing condition of ruins, their past records, and their type of masonry. It is only to be wished that the notes could have been longer. In a short general survey he concludes that the country in the twelfth century was more thickly settled than it is to-day. Extant records provide six hundred place-names for the Latin Kingdom. Of these only half are identifiable, though there are other sites with Crusading remains whose present Arab names cannot be related to any known Frankish equivalent. Distribution on the map is in fact largely governed by the survival of title deeds. Archives of the Teutonic knights, of the Abbey of Mount Tabor, of the canons of the Holy Sepulchre, and of Bethlehem, provide full data for certain areas, while others have to be left comparatively blank. The main castles are more definitely known. The chronicles contain so much information as to military activities that it is unlikely that any of real importance have passed unmentioned. The map brings out particularly clearly the complex scheme of forts protecting the approaches to Jerusalem. The ecclesiastical divisions are marked as are also the principal routes, though some of these latter, particularly in the south, appear somewhat arbitrarily placed. It is for the historian very tantalizing to have so valuable a map governed by the present area of the Mandate and therefore excluding the northern territory of the Kingdom; but within its limits it is the fullest geographical statement of the crusading possessions that has as yet been achieved, and its use will be indispensable in all further study of the subject. T. S. R. B.

ONE HUNDRED YEARS OF BOMBAY. History of the Bombay Chamber of Commerce, 1836–1936. By RAYMOND J. F. SULIVAN. *Bombay: The Times of India Press,* 1938. $10 \times 6\frac{1}{2}$ *inches;* xii + 302 *pages; illustrations, map, and plan.* 30*s*

The Bombay Chamber of Commerce was founded in 1836 by John Skinner, and, except for the Bombay Branch of the Royal Asiatic Society, is the oldest public institution or association still in existence in the Presidency. It was a happy idea to celebrate its centenary by rescuing from oblivion its eventful and enlightening history. The task was entrusted to the present secretary of the Chamber, Mr. Sulivan, whose experience and intimate knowledge of its proceedings have enabled him to present a well-balanced view of its activities and influence. His account will prove of interest even to those well versed in Bombay's history. Few people realize the important part played by the

Chamber not only in the commercial and economic controversies of the period, but also in constitutional developments. There was hardly any public question of first-class importance to which the Chamber did not contribute either by helping to formulate opinion, or by preparing memoranda at the request of the Government or on its own initiative. It may be an exaggeration to suggest, as the Preface does, that the Chamber "took the initiative in well-nigh every social and economic development which we now enjoy," but it is not too much to claim that it took the initiative in many important projects—such as the establishment of the Bombay Port Trust—and played an important part in influencing public opinion and Government policy on practically all subjects of public controversy, including constitutional reform, tariff policy, railways, currency, banking and exchange problems, and matters of more local importance, such as harbour and dock improvements. The Chamber established a reputation for sound sense and broadmindedness and secured the confidence of the Government and of the business world alike. Moreover it played no mean part in helping to overcome social prejudices and promoting co-operation between the various committees. From the first membership was open to members of all communities, ten of the original twenty-five members being Indians. It is interesting to note that the Chamber stigmatized the cotton excise as a legitimate Indian grievance, and on occasion displayed considerable sympathy, tempered by self-interest, with Indian aspirations.

The sequence of the chapters is mainly chronological. In the first place the activities of the Chamber during each decade are described, whilst subsequent chapters are specially devoted to currency questions and the railways. The author does not attempt to analyse fully the economic and other problems involved, but confines himself to an exposition of the motives, attitude, and arguments of the Chamber, and an explanation of Government policy and decisions. These matters are all discussed in relation to general Indian developments, of which a clear account is given. The reader will be disappointed if he seeks new light on the controversies under discussion, but he will find many interesting sidelights on conditions and opinion in Bombay, and be reminded of many facts which help to explain the attitude of those concerned and the policies adopted. V. A.

THRON DER GÖTTER: Erlebnisse der ersten Schweizerischen Himalaya Expedition. By ARNOLD HEIM and AUGUST GANSSER. *Zürich: Morgarten-Verlag A.-G.*, 1938. 9½×6 *inches; 270 pages; illustrations and map.*

To judge by the continual repetition of the words "throne," "gods," and "demons" in the titles of German and Swiss books about the Himalaya it might be expected that their authors were approaching an Asiatic attitude to the mountains. Once again however this is not the case. In fact, apart from the excellent photographs, this is as dull a book about the high places of the earth as could be imagined. It drags along through an inscrutable tangle of place-names, without even a map to help the reader. One diary incident after another breaks all sense of continuity. Even the journey as planned was very irregular; it is further complicated by excursions into Nepal and Tibet that seem surprisingly irresponsible for a scientist of Dr. Heim's reputation. He allowed his younger colleague, Dr. Gansser, to journey to the most sacred spot in Asia half disguised as a Tibetan priest. He took with him a camera and a geological hammer and treated the whole incident as a prank, for which nevertheless explanations had to be made to the government of India.

The travellers who can infect their writing with the strength of their subject are very few. But there are models in mountaineering and travel literature,

and those who approach the really great, as Gansser did Kailas, should turn to Mallory's story of the exploration of Mount Everest. M. A. S.

CHINESE EVERGREEN. By VICTOR PURCELL. *London: Michael Joseph*, 1938. 9×5½ *inches;* 286 *pages;* 10*s* 6*d*

This is an account of a recent journey to Hongkong, Canton, Changsha, Nanning, etc. The author's experiences were quite ordinary, and his comments safe and commonplace. Occasionally he confuses vulgarity with wit. He had previously spent some years learning the language, but his own limitations clearly prevent him knowing much about the Chinese. Much space indeed is occupied with telling us about his European acquaintances, and with trite allusions to European culture.

Some of his statements are decidedly loose. There is no evidence that foot-binding has been practised for thousands of years. Its origin is usually placed with the Mongol invasions.. Nor can it be asserted confidently that the present form of Chinese script was fixed over two thousand years ago. Karlgren, for example, puts the date considerably later, whilst adding that much research is still needed. The temple on the island near Hongkong was certainly not "dedicated" to Kwan-yin. It must have been a Taoist one, and whilst a Chinese, now and of old, would often speak contemptuously of his local god in the way described, it is doubtful if even a sophisticated one would speak thus of the Incarnation of the Spirit of Compassion. The author's presumably facetious reference to Kwan-yin's origin misses fire. There is of course still a male incarnation of Avalokitesvara, but he is never depicted with a beard. Once or twice the author arouses a mild interest when he begins to tell of a conversation on grave political matters, but before he gets anywhere he closes down on the plea of secrecy. There is no profit for any reader in a book of this kind. A. S. E.-S.

AFRICA

ZARZURA: die Oase der kleinen Vögel: die Geschichte einer Expedition in die Libysche Wüste. By ARNOLD HOELLRIEGEL. *Zürich: Orell Füssli*, 1938. 9×6 *inches;* 216 *pages; illustrations and route-map. Fr.* 7.50

This book is an account of the reconnaissance of the Gilf Kebir by the Almásy-Penderel expedition of 1933. The author was a member of the party, as were Hans Casparius (who has provided the photographs for the book) and Ladislas Kádár (who contributed some of the scientific results to the *Journal* for June 1934, pp. 470–78). The text is written in the form of a diary in semi-humorous and romantic style, and, on the whole, is light and readable. The expedition achieved notable results in probing some of the intricacies of the valleys of the Gilf, in journeys to Italian headquarters in Kufra and toward the south-east, and in the discovery of rock paintings. The application of the much-discussed word "Zarzura" to a part of the Gilf is a matter for discussion. Some such book as this was needed to give an indication of the wanderings of Penderel and Almásy in this quarter of the desert, where the scene has changed from the unknown land penetrated by Hussanein Bey and Prince Kemal ed Din to a territory cut up by British and Italian car tracks, landing grounds, and military encampments. In a few years the region may be forgotten again, and it may be left for another generation of travellers to discover the relics of those who in the '20's and '30's pushed their cars through the rock and sand of one of the last of Africa's twentieth century No Man's Lands. The author catches the spirit of these journeys, and the exaggerated style is perhaps unavoidable if he is to transmit something of it to a workaday and sophisticated public.

The book is well printed, the map serves its purpose, but there is no index; the profuse photographs of the open desert and rugged country are extremely good and are well produced. Special mention should also be made of a portrait-photograph of the Tibbu Ibrahim, an outstanding success. K. S. S.

BLACK AND WHITE MAKE BROWN: an account of a journey to the Cape Verde Islands and Portuguese Guinea. By ARCHIBALD LYALL. *London: William Heinemann*, 1938. 9×5½ *inches;* x+304 *pages; illustrations and maps.* 18*s*

This is not Mr. Lyall's first travel book, but undoubtedly it is the most interesting. He spent several months in the Portuguese colonies of Cape Verde and Guinea, during which he saw all that was possible with the means of transport at his disposal. He has not however seen every thing he writes about, as, for instance, in his story of a dead donkey in a Lisbon reservoir.

Although many books in other languages have been written about these colonies, the author claims that they are still little known. His book, nevertheless, is the most comprehensive, and possesses a topical interest in view of the strategical importance of the Cape Verde Islands and the rumours current about the state of affairs in the Bissagos Islands. Mr. Lyall visited the whole archipelago, and stayed three weeks in Bubaque Island, enjoying the hospitality of the German Company which runs the important palm-oil factory there. From what he has seen he dismisses as untrue the stories that "Bubaque is full of oil stores for aeroplanes, submarines and surface ships," and that "the authority of Lisbon and its control have become practically non-existent" in the archipelago.

Almost all the Cape Verde Islands and the whole of Guinea were visited by him, and he gives a colourful picture of life and nature as he saw them. His remarks on the native poetry of the Cape Verde Islands and the artistic skill of the Nalus and Bissagos wood sculptors, in Guinea, are very interesting indeed. The two colonies are studied in all their aspects, and praise is bestowed upon the Portuguese colonial administration.

With the exception perhaps of the two first chapters, the whole book is fascinating; there are however a few slips. Pedro Nunes is described as "astronomer, cosmographer and mathematician of Prince Henry the Navigator" (p. 19). Prince Henry died in 1460 and Pedro Nunes was born in 1502. "Prince Henry's brother, Dom Pedro, brought him from Venice . . . the portolan of Sanuto and Dulcert . . ., the famous Laurentian portolan . . ., the Catalan Atlas and many rare Venetian maps . . ." (p. 19). So far as it is known, D. Pedro brought from Venice only one map, lost long ago and about which nothing positive is known. Prince Henry did not live in the houses or hear Mass in the chapel now existing in Sagres (p. 23). They were built much later, after his death. The highest peak in the Portuguese Empire is not in Fogo Island (2829 m.) but Tata Mailau (2920 m.) in Portuguese Timor. The Guinea "chabeu" is not "the red-brown oil of the little palm-nuts, which would, if they were left on the trees, one day grow into coconuts" (p. 202). The palm in question is the oil palm (*Elaeis Guineensis*), not the coconut palm (*Cocus nucifera*). The former is a native plant of Guinea and the latter an introduced one.

The reviewer, who has visited the Cape Verde Islands and Guinea several times, and is acquainted with most of what has been published on these colonies, knows of no more readable and stimulating book than this. It deserves to be appreciated by those interested in colonial life and the literature of travel.

A. Z. C.

THE BANTU TRIBES OF SOUTH AFRICA: reproductions of photographic studies by A. M. DUGGAN-CRONIN. Vol. III, Section III, Plates LXXXI–CXX. The Nguni. Section III. The Zulu. With an introductory article by D. McK. MALCOLM. *Cambridge: Deighton, Bell & Co.—Kimberley: Alexander McGregor Memorial Museum*, 1938. 11½×8½ *inches; 15 pages and plates.* 25*s*

The series of photographic studies of the Bantu, to which this is the most recent contribution, has established for Mr. Duggan-Cronin a deservedly high reputation. In their natural surroundings and free from the conventions of the studio the Zulu, one of the sub-groups of the Nguni, are depicted in the activities of their normal life. Preceding the photographs, valuable notes in the short letterpress afford a concise history of these people. The term "Zulu" is now applied to a population of about two millions, the descendants of a confederation of tribes who, early in the nineteenth century, were welded together under military pressure by the renowned Chaka. Their domain extends from Swaziland in the north to Pondoland in the south, and from the Drakensberg to the eastern coast.

The occupations of the Zulu are seen to be divided fairly strictly between the sexes, so that, although women work in the fields with the hoe, ploughing in which cattle are used is normally reserved to the men. The ever-increasing demands for labour by the white society of South Africa are however gradually removing the prohibition which has hitherto prevented women from working with cattle; for when, as now so often happens, many of the men are absent from the kraal during the ploughing season, the major share of the field work must fall upon the women. Features of domestic architecture, such as the change from the "beehive" hut to the circular hut of solid, upright walls used by the Xosa peoples, and the plan of a typical Zulu kraal, are also discussed and depicted.

W. F.

AUSTRALASIA AND PACIFIC

PROBLEMS OF THE PACIFIC, 1936: aims and results of the social and economic policies in Pacific countries. Edited by W. L. HOLLAND and KATE L. MITCHELL. (Proceedings of the Sixth Conference of Pacific Relations, California, 1936.) *London: Oxford University Press*, 1937. 9½×6½ *inches;* x+470 *pages.* 21*s*

Political developments in the Orient have been so rapid that any writer may well hesitate to put pen to paper lest his comments become out of date before the ink is dry. If only as historical documents however the proceedings of the Sixth Conference of the Institute of Pacific Relations held at Yosemite in 1936 will remain of permanent value, while the mass of carefully digested data they embody cannot be neglected by any serious student of Far Eastern affairs.

After a brief introduction summarizing the Pacific scene during the interval since the previous conference at Banff in 1933, the report outlines the aims and results of the social and economic policies of the circum-Pacific countries as presented at round-table discussions. (In preparation for these sessions forty to fifty questions had been carefully framed for each of five topics. The final selection, dealing particularly with international implications, which formed the basis for discussions, occupies five pages of small type in the Appendix.) The world effects of current American monetary, trade, and foreign policies are considered in some detail. Japan's commercial expansion, internal economic difficulties, and foreign policy are fully discussed, stress being laid on the fact that with her limited raw materials all increases of export can be

achieved only with the help of correspondingly raised imports. One may note in passing how tragically later events give point to the findings of the group concerning Japan's internal problems. Equally prophetic passages are found in the section devoted to China. "Formerly a negative or passive attitude among the people to the government was normal; a change had to be made... and this change, however slowly or sporadically, has unmistakably already set in." The position of the Soviet Republic in the Far East was dealt with by a fourth group, special attention being given to development of her natural resources in the light of the second five-year plan. The résumé of the plenary discussions ends with the ominous sentence: "And thus in the economic as in the political field the efforts of the round table to find adequate forms of peaceful adjustment ended with the members confronting the fundamental dilemma of deciding what type of world society and economy was to be made the end of national policy and international negotiation."

The second two hundred pages of the report present six of the eighty documents and data-papers prepared for the Conference: trade and trade rivalry between the United States and Japan; factors affecting the recent industrial development of Japan; resources and economic development of the Soviet Far East; the Chinese Communist movement; the reconstruction movement in China; and diplomatic machinery in the Pacific. To students of economic and political geography these authoritative digests will come as a valuable source material, of special usefulness in analysing the kaleidoscopic changes in the pattern of human affairs in the Far East. G. B. B.

PHYSICAL AND BIOLOGICAL GEOGRAPHY

HURRICANES . . . PARTICULARLY THOSE OF THE WEST INDIES and the southern coasts of the United States. By IVAN RAY TANNEHILL. *Princeton (New Jersey) University Press (London: Oxford University Press)*, 1938. 9½×6 *inches; x+258 pages; illustrations and maps*, 16*s*

The typhoons of the Pacific, the cyclones of the Bay of Bengal, and the hurricanes of the West Indies are among the most violent of natural phenomena. From the time of Columbus hurricanes have been a menace to shipping in West Indian waters, and they have caused several major disasters to American cities. Since 1898 the U.S. Weather Bureau has built up a great organization to study and forecast their developments and tracks, and in this book by the Chief of the Marine Division of the Bureau we have a closely packed summary of the knowledge gathered during more than a generation.

The first half of the book is very readable. The author describes the structure of a hurricane rather briefly, but he gives several striking accounts and one most notable photograph of the passage of the calm central "eye." He quotes some of the outstanding wind velocities recorded by the few anemometers that have withstood the onslaught of the strongest winds, but he seems more interested in the disastrous storm waves, the development of which he describes in some detail. In a later chapter he returns to the third element of danger, the torrential rainfall which so often causes flooding and disease.

This has all been done before; the scientific value of the book is the immense wealth of cartographic detail, especially in the second half. The tracks of several hundred hurricanes are depicted, month by month and year by year, including reconstructions of the movements of some historic storms from 1780 onwards. The "Great Hurricane" of 1780, one of the most destructive storms in the history of the world, is described at some length. The causes of aberrant tracks are discussed, and one series of charts of the greatest interest

pictures the birth of a hurricane, throwing much light on a long-standing controversy.

An appendix gives a chronological list of all known West Indian hurricanes from June 1494 to 1900. There is a comprehensive bibliography and a good index, and all this part of the book will be invaluable for reference.

Although the work deals mainly with West Indian hurricanes, there are many accounts of storms in other parts of the world, including the great Samoa hurricane of 1889 which may have changed the face of history. C. E. P. B.

DAS GLETSCHERBUCH. By WALTHER FLAIG. *Leipzig: F. A. Brockhaus*, 1938. 9½×6½ *inches; 196 pages; illustrations and maps. M.8.80 (unbound M.7.50)*

Even the novice alpine climber quickly realizes that mountain ice is not "just ice," and before long he finds that much of his pleasure lies in solving the often difficult problems presented by its varying surface, its séracs and crevasses, and its exposure to sun and snowfall. If he is at all scientifically minded he will soon want explanations, but, unless he has had a mathematical and physical training, most of the standard works will remain for him closed books, and he will miss the added fascination which comes with a knowledge of the structure and properties of his glacier. Herr Flaig's book satisfies his want; it is not a glaciology but rather a hand-book of glacier lore, and in the first chapter shows that far from being just ice, a glacier is a *Weltmacht*. With reproductions of old pictures and maps the history of *aevi glacies* is traced from Seneca to the classical researches of the nineteenth century by Agassiz, Forbes, and others, and so to the Innsbruck school of the present day. There are eminently readable chapters on the plastic motion of glaciers and their effect on topography, both in remote ice-ages and in more recent times, with inquiries into theoretical questions such as the thickness of the ice, its slow evolution from firn snow and the production of blue-bands; and on what is of more vital importance to the practical mountaineer, the bridging of crevasses and the formation of ice-dams and lakes. There is a fairly comprehensive bibliography and a list of routes to the more important alpine glaciers. It is unfortunate that the writer confines himself only to the latter, for a similar work on polar glaciology would form a useful introduction for students. In addition there are more than a hundred well-produced photographs which alone would make the book a worthy acquisition to any mountaineering library. R. M.

ECONOMIC AND HISTORICAL GEOGRAPHY

ENVIRONMENT, RACE, AND MIGRATION: fundamentals of human distribution: with special sections on racial classification; and settlement in Canada and Australia. By GRIFFITH TAYLOR. *Toronto: The University of Toronto Press (London: Oxford U.P.)*, 1937. 9½×6 *inches;* xvi+484 *pages; illustrations and maps.* 15*s*

This volume is a collection of studies, most of them already published elsewhere, which fall into two groups with little in common in subject matter or method. Part II is a restatement of Professor Taylor's views on the racial history of man, while Part III contains a series of sketches in the geography of settlement, and Part IV records an attempt to work out and map indices of habitability for areas of white settlement and to gauge thereby the possibilities of their future development.

The author's application of the "age and area" theory to racial distributions is open to serious objections. With the proposition that certain racial characters

now have a more restricted and peripheral distribution than in earlier times, there will be little disagreement. But the attempt to establish a uniform scheme of racial succession for all parts of the world depends on the unproven claim for a series of waves of expansion from a single area of characterization "in Turkestan or thereabouts," and involves the author in contradictions and in distortion of the data and methods of physical anthropology and prehistory.

The assumption that all the mutations which have resulted in the emergence of distinct human stocks occurred in a single area is claimed as an inference from highly generalized distribution maps, on the basis of a very loose classification of somatological characters. Hair form, for which great significance as a racial index is claimed at the outset, is set aside later when it is desired to equate European "Alpines" with east Asiatic "Mongoloids." Elsewhere this assumption, with its corollary of increasing broad-headedness of successively evolved human types, is itself abandoned. Having claimed both that the brachycephalic negritos are the most primitive of human stocks and also that "the broad headed stocks are a later product of evolution than the narrow heads," Professor Taylor attempts to resolve the difficulty by assuming "two pithecoid stocks in Asia in Pliocene times which give rise to permanent races" in order to achieve a separation of the negritos from the rest of humanity, without apparently realizing that this undermines his original position.

In order to establish the racial "strata" whose uniform sequence is claimed, the author asserts the past existence of racial stocks in particular areas on quite inadequate evidence, in which criteria of race, culture, and language, whose non-correspondence is elsewhere admitted, are inextricably confused. It is claimed, for instance, that representatives of his third, Negroid, stratum formerly existed in central Asia on the ground that a "Neanderthal-Negro-Australoid" stock can be inferred from the occurrence of a Mousterian industry at one site. In another context the terms Neanderthal, Negroid, and Australoid refer to types belonging to distinct "strata." The former presence of negrito stocks is similarly postulated on the basis of an incorrect and in any case inadequate claim that "artifacts of Aurignacian types are commonly associated with this race," while cultural data, "artifacts, place-names, folklore, etc." are explicitly accepted as evidences of "buried strata" in areas "where racial evolution has progressed farthest."

Impressed by the heuristic convenience of the stratigraphical analogy the author loses sight of the simple fact that human populations are not geological deposits. The complex processes of mutation, crossing, and segregation of characters in living organisms cannot be successfully portrayed in terms of "inliers," "contact metamorphism," and so forth. In the interpretation of distributions a recognition of the nature and limitations of the data mapped is all important, and it is the lack of precision and consistency in the handling of anthropological data that invalidates the results claimed for the present study.

Part III deals with physical conditions and human settlement in Australia and Canada. The Australian chapters summarize material that the author has expounded at greater length on previous occasions, but the Canadian section in which the Dominion is surveyed on a regional basis contains much that is new, and Professor Taylor makes full use of his gift for constructing vivid sketch-maps and diagrams, and of his personal experience on recent journeys, in discussing the relation of physical conditions to the course of settlement.

Part IV is a revision and expansion of an earlier paper on "Future White settlement," in which a potential density of white population is estimated by means of "econographs" for seventy-four regions into which the land surface of the world is divided. The econographs are rectangular figures formed on

axes which vary with mean annual temperatures and rainfalls, mean elevations, and estimated coal reserves. The relative weighting of these elements was determined empirically from test cases and the area of the resultant econograph for a given region is regarded as an index of habitability, which is in turn translated into a density of population. Professor Taylor admits the subjective element involved in the selection and weighting of the criteria, and does not claim any absolute validity for the densities arrived at, but his maps and diagrams serve admirably to throw into relief the wide discrepancy between actual and potential settlement in the various regions of the world. C. D. F.

GENERAL

A SKETCH-MAP HISTORY OF THE GREAT WAR AND AFTER, 1914–1935. By IRENE RICHARDS, J. B. GOODSON, and J. A. MORRIS. (Sketch-map histories. 3. General Editor: GEORGE TAYLOR). *London: George G. Harrap & Co.*, 1938. 10×7½ *inches;* 136 *pages; sketch-maps.* 3*s* 6*d*

This book is designed to familiarize pupils with the main events of the war and of the post-war years in relation to the geographical environment. A good deal of information is entered upon the sketch-maps, which are also accompanied by explanatory text. This method undoubtedly makes for a better understanding of a complicated subject, though it is perhaps too much to expect that, even with this assistance, a pupil will be able to master all the facts. The section on the war is the most successful, particularly in emphasizing the inter-connection of events in separate theatres. The authors have striven to treat post-war policies and movements in the Allied and ex-enemy countries impartially, and are certainly generous to the latter. The sincerity of this attempt must be recognized, without agreeing with all the opinions expressed.

It is to be regretted that in the later sections there are a number of errors and statements which might be questioned; *e.g.* the Yaman has not been annexed by Sa'udi Arabia; the Geneva Protocol of 1924 was never ratified by the Powers; the Locarno Pact did not guarantee all the new boundaries in Europe; a regular passenger service across the Atlantic was not begun in 1937. G. R. C.

THE WAVELESS PLAIN: an Italian autobiography. By WALTER STARKIE. *London: John Murray*, 1938. 9×5½ *inches;* xviii+512 *pages;* 12*s* 6*d*

The end of the War found Professor Starkie in Genoa, and the earlier chapters of his autobiography are concerned with recollections of his work with the troops in north Italy. He was finally demobilized in Taranto, and went wandering in his own style through Calabria and on to Sicily. Later, when he had settled down in Dublin, he had occasion to return to Italy frequently. He ends with a few pages on his experiences in Abyssinia, where he visited the Italian forces during the recent campaign. Some of his chapters deal with exclusively literary subjects, and others with the gipsy folklore that particularly interests him. The book as a whole however portrays very vividly the developments that took place in Italy after and as a consequence of the War, and most people will admire the saneness and conspicuous fairness (marred only by an occasional historical error) with which Professor Starkie presents a picture of the peninsula from Monte Grappa to Messina. J. P. H. M.

THE MONTHLY RECORD

JUNGFRAUJOCH RESEARCH EXPEDITION

At the end of April Mr. G. Seligman, author of 'Snow structure and ski fields,' took a party of scientific workers to the Jungfraujoch Research Institute in Switzerland to undertake intensive research into the physics of glaciers. This is claimed to be the first British expedition ever to spend its whole time studying glaciological problems, but it should be remembered that valuable work especially on the more geographical aspects of the subject was done by Forbes and Tyndall in the Alps, Wright and Priestley in the Antarctic, and others elsewhere. The party consists of Mr. T. P. Hughes, of the Physical-Chemical Laboratory, Cambridge, physicist; Mr. M. F. Perutz, of the Crystallographic Laboratory, Cambridge; Mr. A. E. Benfield, of the Department of Geodesy and Geophysics, Cambridge; and Mr. E. A. Ferguson, of the Department of Geography, Cambridge. The work will continue Mr. Seligman's previous researches on the nature of snow wherein he established the changes of structure which mark the transition of firn into glacier ice, and the chief problem to be investigated will be the precise location in the moving ice-masses where this important change occurs. Other problems, particularly those bearing on the main question, will also be investigated, including the movement of glaciers, the formation of ice-bands and their connection, if any, between those in the firn region and those near the snout of the glacier. In addition Mr. Hughes will carry out certain experiments on the friction of solid bodies on ice.

Further work will be the collection of meteorological data bearing on the scheme of research, and the collection and analysis of pollen grains falling on the snow and becoming embodied in the ice. On the latter subject Mr. Seligman is co-operating with Dr. Vareschi, a German botanist, who discovered a method that promises to yield information concerning the seasonal age of the ice and to help to settle the vexed question of "blue bands" and dirt bands in glaciers.

Since the middle of 1937 Mr. Seligman has spent much time studying the vast bibliography of the subject, settling details of the programme of work, designing plant and apparatus and making preliminary visits to the Jungfraujoch. It is anticipated that the party will remain there at an elevation over 11,000 feet till the end of September, and that the first month will be occupied in setting up instruments, boring temperature holes, and making a laboratory dug-out in the ice for the observation of ice specimens at low temperature, the work proper being timed to start at the beginning of June. Mr. Seligman has been granted a Leverhulme Research Fellowship for the purpose of this research, and the expedition is also supported by the Royal Geographical Society, the Ski Club of Great Britain, and the Alpine Ski Club.

JOURNEYS IN THE WESTERN SAHARA

In January of this year, two French travellers, Mlles Odette du Puigaudeau and Marion Senones, returned from an extensive journey in Mauritania and the western Sahara. They had gained experience of this region in 1934, when, reaching Cape Timris by sea, they had journeyed to Nouakchott, and thence south-east by a series of zigzags through the Sahara border north of the Senegal. Illness obliged them to proceed to Dakar, but shortly afterwards they were able to return by motor truck to Nouakchott. Thence they set out north-eastwards to Atar, to work in the Adrar region. From Atar they visited Chinguetti and Wadan. The season, owing to the great heat and constant sandstorms, was not ideal for travelling, but they were rewarded by being able to

witness the activities connected with the date harvest. They finally returned to Port-Etienne, partly by an arduous journey with camels across the Inchiri desert. They brought back with them an important collection of pre-historic implements and ethnographical objects.

This journey was conducted entirely with their own resources. Its success secured for their second journey support from government and scientific institutions, and they were thus able to plan a more ambitious itinerary. Early in 1937, they left Tiznit in southern Morocco for the valley of Wadi Dra'a and Tindouf, where they prepared for their first crossing of the western Sahara. The first stage lay close to the Rio de Oro boundary for 600 kilometres of stony desert. Three out of the four water-holes proved to be brackish. At Bir Moghrein they obtained an escort of four warriors for the further 600 km. to Chinguetti, where they were again welcomed by officials and natives. In April they continued south through the Taiert of the Idaouali, a dreary valley among high dunes, across the black volcanic plateau of Charania, and the *erg* of Rhat, to the great palm groves extending from Tagant to Tidjikja. With this post as centre they examined the region to south and west, before leaving for the more congenial and familiar environment of the Sahel, where they found many rock paintings and pre-Islamic ruins, as they progressed by Walata to Timbuktu.

Here they began to prepare for their return journey across the Sahara. After meeting with many difficulties, they succeeded in obtaining the necessary camels and proceeded to Arawan to join the great caravan of five thousand camels on its way to the salt mines at Taudeni. There is no water to be found on this stage, and they were obliged to travel continuously for twelve hours a day for ten days. After a halt of four days, they joined a military detachment and resumed their journey to the north-west, passing through the deserted salt mines of Taghazza, and finally reaching Tiznit exactly one year after their departure. Their extensive collections include fossils, plants, rock drawings, and films.

LAND SURVEY IN THE KANO EMIRATE

In the *Journal* of the Royal African Society for January 1938, Mr. D. F. H. MacBride describes the system of land survey employed in the Kano Emirate. The system is adapted to an area of dense agricultural population with permanent and well-defined holdings. About 2000 square miles around Kano city conform to this requirement, though the system is only at present in force in the four central districts, about 488 square miles in area. With the beginning of British administration in 1903, the assessment of cultivated lands by inspection by fief holders and officers of the Emir, in force under Fulani rule, was continued, though it was soon found that a more rigid method was necessary. The fiefs were first consolidated into districts, and in 1909 the measurement of farms was begun. The system known as "Taki," *i.e.* pacing, consisted in stepping out the necessary lines to calculate the area of the farm, assumed to be a trapezoid. Calculations were made from the surveyor's figures without plotting. In 1914 this method was elaborated, the farm was assumed to be a trapezium and was plotted from the measurement of four sides and a diagonal by a 22-yard rope, and a 6-foot pole for offsets. The figures were plotted on ruled paper by a computing scale. It was decided in 1917 that the increased sums to be obtained from a more rigorous assessment would justify greater accuracy in measurement. Accordingly the outer boundaries of village areas are now run with theodolite and chain, with an inner traverse to fix the larger units. The work of the surveyors is checked by draughtsmen and computers independently. The Emirate Survey Department is recruited as far as possible

from local schools, and the chief surveyor is a native of Kano. The fixed points are now tied to the main triangulation of the government survey, and a separate topographical survey of the Emirate is in progress.

GEOGRAPHICAL DISTRIBUTION OF WORLD WHEAT ACREAGE

To *Wheat Studies* (March 1937) of the Food Research Institute, Stanford University, Mr. M. K. Bennett and Miss H. C. Farnsworth have contributed a study of the geographical distribution of the world wheat acreage, the geographical differences in the average wheat yield per acre, and the relations of these to climate. The period examined is in general 1920–34. The results obtained have been plotted on a world map, one dot to 25,000 acres, with seven levels of yield distinguished by colour. The total world acreage is estimated at 400,000,000 acres, of which approximately one-third are in Asia, rather less than a third in Europe, and just under a quarter in North America. Approximately 19 per cent. of the area is in the British Empire. The highest yields are obtained in north-west Europe, the Netherlands, Denmark, Belgium, and the British Isles showing yields of more than 33 bushels per acre. The lowest yields recorded are those of the Italian colonies of Tripolitania and Cyrenaica. With regard to climate, the authors conclude that an average annual rainfall of 25–35 inches, with a pre-harvest fall of 4–6 inches, a pre-harvest temperature of 58°–60° F., with an average annual temperature of 12°–16° below this figure, and a marine rather than a continental climate, are the most suitable conditions for wheat growing. The heaviest concentration of acreage is in the 15–20 inches rainfall zone, but this is a comparatively recent development. The importance of a high level of wheat culture, shown by the yields obtained in the north-west European countries, is emphasized: all areas could not benefit from its introduction, but the authors believe that it could probably be extended to twice the present acreage.

In two further studies (November 1937 and March 1938) Mr. Bennett examines the trend of yields in fourteen major wheat regions since 1885, excluding areas in Asia. Five areas, northern Europe, France, Italy, eastern North America, and the United States Soft Winter region, show an upward tendency throughout the period. Five other regions, including the U.S. Spring region and the Prairie Provinces of Canada, show a tendency to stability or downward drift over the whole period, though not continuously. The factors affecting yield are the shifting of wheat acreage within the particular area (this is generally unfavourable as it means movement to poorer land), the incidence of bad years (in many parts of Europe this has affected the figures favourably, as weather conditions were better in the later years), improvements in agricultural technique and in varieties sown, and government action. The last two have had the greatest effect, particularly the enlarged use of fertilizers. Allowing for accidental factors, the author considers that an increase in world yield of perhaps 0·8 of a bushel occurred between 1890 and 1910, and that a generally declining tendency prevailed from 1910 to 1930, though amounting only to about 0·2 of a bushel.

DISCOVERY

With the April number the monthly journal *Discovery* was taken over by the Cambridge University Press. The format has been altered, the type and design much improved, and the number and quality of the illustrations raised. *Discovery* aims at presenting accurately and clearly contemporary progress in the sciences and other branches of human activity, including travel. Papers in recent numbers have dealt with colour photography, changes in the level of the land, progress in astronomy, and early man in America, in addition to

lectures given under the auspices of the Cambridge History of Science Committee. The interests covered are thus very wide, and the periodical provides a useful summary of scientific progress in a non-technical manner.

OBITUARY

HENRY J. PATTEN

We record with much regret the death on February 24 of Mr. Henry Patten, of Chicago. He had travelled extensively in South America, Asia, and the Pacific Islands, and was much interested in Polar exploration. From 1914 to 1916 he was President, and later Director, of the Geographical Society of Chicago. Mr. Patten was a very generous friend of our Society, which he joined in 1921. On his visits to the Society's House it was his custom to inquire if there were some immediate need to which he might contribute; in this way the Society is indebted to him for a number of instruments and additions to its equipment, and greatly regrets the loss of so kindly a benefactor.

MEETINGS: SESSION 1937–38

Annual General Meeting, 20 June 1938. The Deputy President, Professor Kenneth Mason, in the Chair.

The HON. SECRETARY (Mr. W. L. Sclater) read the Minutes of the Annual Meeting held on 18 October 1937, which were confirmed and signed by the Deputy President.

The DEPUTY PRESIDENT then said: The Agenda for this Annual General Meeting are laid down in the Bye-Laws of the Society, and the first duty of the President for whom I am acting this afternoon is to present the Gold Medals and other Awards of the Society.

The Founder's Medal has, with the approval of His Majesty, been awarded to Mr. John Rymill; and the great part which successive papers from his British Graham Land Expedition have played in the programme of the session which is now ending has shown that no medal of recent years has been better earned. There was a large territory of the Antarctic, included in the British section of the Falkland Islands Dependencies, of which the coasts had been reconnoitred by successive expeditions from many nations in the last hundred years, and more recently had been viewed from the air by Sir Hubert Wilkins and Mr. Lincoln Ellsworth, but which had never been explored by a land party: so that the relations of its various parts and their accurate placing upon the map were the subject of very grave doubts. We have heard in the series of papers a fine story of triumph over initial difficulties and eventual great success. Mr. Rymill has been the first to acknowledge the debt he owes to his companions, both the ship party under the able command of Lieutenant Ryder, and the shore party of surveyors and scientists whom he inspired and commanded. We regret that he is unable to be present to receive in person this recognition of his labours. But he is represented by Mr. Hampton, his second in command, and pilot of the modest aeroplane which rendered such invaluable service to the

expedition; and I will ask him to receive the Medal for Mr. Rymill and transmit to him our best wishes for a renewal of his Antarctic enterprise. I will ask our senior Past President, Sir Francis Younghusband, to hand Mr. Hampton the Medal.

Mr. W. E. HAMPTON: When Mr. Rymill asked me to be present this afternoon to receive the Founder's Medal, he expressed the wish that I should not only thank the Society most cordially on his behalf but also on behalf of the whole expedition, for he considered that the award was as much deserved by the members as by himself. I must however qualify that, for no matter how great the support a leader receives from his colleagues there still remains the responsibility of organization, and as a representative of the other members of the expedition I must say how pleased they are that their leader should receive this honour. I know Mr. Rymill would agree with me when I say how grateful we are to the Society not only for the award of the Founder's Medal but for the very great financial assistance and moral support, without which the expedition would have been impossible.

Included in our thanks to-day I should like particularly to mention our gratitude to the Society's Secretary. No matter how busy Mr. Hinks has been he has always found time not only to deal with the business side of expeditions but to take keen interest in their work; indeed, he becomes as absorbed in their problems as do the members themselves. I should like to record our pleasure and add our congratulations on the occasion of Mr. Hinks receiving the Victoria Medal.

Mr. Deputy President, I thank you on behalf of Mr. Rymill for this very great honour which you have conferred on him.

The DEPUTY PRESIDENT: *The Patron's Medal* is awarded to Mr. Eric Shipton, who combines a most distinguished record of mountain climbing with an ardent passion for mountain exploration, which appeals to this Society even more strongly. For many years Nanda Devi stood encircled by a ring of mountains that successive mountaineers had failed to penetrate, and it was Shipton who pioneered the route which eventually gave access to the inner sanctuary, so successfully that when the way was found it has been followed not only by the mountaineers who conquered the peak, but by parties of the Indian Survey who have successfully mapped the whole massif. More recently he led the Shaksgam Expedition of 1937, which celebrated the fiftieth anniversary of Sir Francis Younghusband's discovery of the Aghil pass by mapping and exploring all that was left of that area and the magnificent glacier region to the south and west on the northern flank of the Karakoram; and now he is for the third time on a Mount Everest expedition, and we wait with subdued confidence for the news that the weather has been kind and that the expedition under the command of Tilman has triumphed. Mr. Shipton's presence with that expedition is the best possible cause of his absence to-day. I will ask his mother, who is present, to accept the Medal on behalf of her son, and to assure him of our good wishes for further success in the work to which he is so ably devoting his life.

Sir FRANCIS YOUNGHUSBAND: Mrs. Haly, it gives me very special pleasure to be able to hand you this medal, because it was fifty years ago that I originally explored the region of the Shaksgam which your son overcame last year. I wish him every possible success. I hope he will conquer Mount Everest and will then return to that most fascinating region, the Shaksgam.

Mrs. HALY: On behalf of my son I thank you very much indeed.

The DEPUTY PRESIDENT: *The Victoria Medal* is bestowed upon a very worthy recipient, Mr. A. R. Hinks. He has laboured whole-heartedly in the Society's interests for some twenty-five years, during which he has held the onerous and

responsible post of Secretary. No one probably has so wide a grasp of the extremely versatile and wide-ranging science of Geography as he has, and apart from his detailed knowledge of the routine and machinery which is involved in the administration of this great Society, his advice to those who have organized and taken part in numberless expeditions has been both freely given and invaluable. It is always acknowledged by recipients of other awards, as you have heard to-day. His recent very successful completion of that valuable aid to explorers, the new edition of 'Hints to travellers,' is a piece of work of which he may well feel proud. But his claim to this award is based more especially upon his distinction as a scientist in the field of Mathematical Geography, and it is with special pleasure that I invite Mr. Hinks to accept the Medal as one who has done much to promote our science and to advance the interests of the Society.

Sir FRANCIS YOUNGHUSBAND: Mr. Hinks, it is a special pleasure to me to have the honour of handing you this gold medal. It is thirty-three years since I first made your acquaintance when you were at the Astronomical Observatory at Cambridge. But when the Royal Geographical Society made its call upon you, you did not hesitate to descend from the starry heavens and come down to the sordid earth below, and here in a terrestrial society you have brought distinction to us.

Mr. A. R. HINKS: Mr. Deputy President and Sir Francis Younghusband, I find it impossible to tell you how deeply grateful I am to the Society for having awarded me this medal of singular distinction, and allowed me to take a place in the roll of those people who have so eminently cultivated the sciences mentioned in the terms of the award, the science and the art of which I am a humble student. It is no small thing to think that I shall one day appear in the same list as that which contains the name of my old chief at Cambridge, Sir George Darwin, of Sir Sidney Burrard, Sir Charles Close, and Mr. J. F. Hayford, as well as some of my old friends and colleagues in the Society. I cannot find words in which to better express my appreciation.

The DEPUTY PRESIDENT: *The Murchison Grant* is awarded to Mr. Martin Lindsay for his journey across Greenland in 1934. When he laid his plans before our Society, they were considered perhaps over-ambitious and without a reasonable margin of safety. It was therefore with the more sincere pleasure that the Society welcomed him on the successful termination of the longest sledge journey ever made in Greenland. His book on this journey and his lecture to us were of distinguished merit, and provided much valuable material for the Polar Section of the recently published 'Hints to travellers.' Volume II. It was full time that we should recognize the work of Mr. Lindsay, and his companions, Mr. Croft and Mr. Godfrey, by this the oldest established of our four Awards.

Mr. MARTIN LINDSAY: I am very proud indeed to receive this award and thank you very much for having granted it. I also thank you, Sir, for the kind words in which you have given it to me. I like to think, too, that this award is shared by my companions, Mr. Croft and Mr. Godfrey, and that their work has been appreciated also.

I would like very much to support what Mr. Hampton has already said with regard to the Secretary of this Society, because there is no doubt whatever that nobody except those in the immediate circle of travellers can possibly realize how much we owe to Mr. Hinks for his encouragement, his advice, and assistance. Therefore, it is especially gratifying to us that the President and Council have in their wisdom included him in this presentation of awards this afternoon.

The DEPUTY PRESIDENT: *The Back Grant* is awarded to Mr. Thomas Hay for his contributions to the physical geography of the Lake District. Successive papers in the *Journal* have shown the great interest of his studies of glaciation in the English Lake District, so important to students of the English landscape. Moreover he has rendered service to several Arctic expeditions by taking some of our younger explorers over the ground at home and showing them how to read the effects of past glaciation in country from which the ice has since retreated. We wish him many years of this fruitful work in his retirement. Mr. Hay will probably not now wish to carry away with him this pile of books, in which form he has chosen to receive his Award.

Mr. THOMAS HAY: I wish to thank you very deeply indeed for your kindness this afternoon. I remember once being out with Dr. Marr, who was well known to this Society, and we were naturally talking about geology. He was lamenting the fact that the amateur geologist was gradually disappearing and contrasting the then times with olden times. I think he was rather encouraging me to go on with geology, but he ended up with a very strange piece of advice which I have always followed. He said: "Do not read too much." That is one of the admonitions I have carried out, and now in my old age as a result of your kindness I am going to try to remedy the damage. I thank you very much indeed.

The DEPUTY PRESIDENT: *The Cuthbert Peek Grant* is awarded to Mr. Bradford Washburn for his explorations and glacier studies in Alaska. His travels by land and air in Alaska and on the borders between the United States and British Territory have given us two striking lectures within the last few years and added much to the modern technique of mountain exploration with the aid of the aeroplane. He is again this summer in Alaska, and we have been concerned to learn recently of a tragic air accident which may affect his plans. Mr. Washburn is not able to be here. I will therefore hand the award to one of the Honorary Secretaries who will transmit it in due course.

The Gill Memorial is awarded to Mr. Ivan Champion for his explorations and surveys in Papua. He was a companion of Mr. Karius in the great journey across the central ranges between Papua and the Territory of New Guinea which gained for his leader the Patron's Medal in 1929. Since then he has been active in a continued exploration of that most difficult country, and we have had in our hands for some months the account of the Bamu–Purari Patrol of 1936 which has provided for the first time a long series of astronomical positions along the northern boundary of Papua. We are hoping to publish in the course of this year an account of this patrol, and a map which will show its relations with the journeys of Mr. Michael Leahy described in the *Journal* two years ago. Mr. Champion is reported to be engaged in founding a government station upon the newly discovered Lake Kutubu, and we are not certain that the news of this award has yet reached him, although it was sent some time ago. I ask the Honorary Secretaries to transmit it to him through the Government of Papua, with our congratulations and best wishes for the peaceful development of the new territory which he has so successfully explored.

My next duty is to read the Address which the President has written, and which in his much regretted absence it falls to me to deliver.

The DEPUTY PRESIDENT then read the Presidential Address which will be found printed on pp. 97–106.

Visitors having withdrawn, the DEPUTY PRESIDENT appointed Major John Morris and Mr. W. E. Hampton to act as scrutineers of the Ballot for the Officers and Council for the ensuing year.

The DEPUTY PRESIDENT, in submitting the Annual Report of the Council, said:

The Annual Report of the Council has been circulated to all Fellows and copies are also distributed in this Hall. The President has dealt in the Address which I have read to you with the points in the Report of special importance to the Society at this juncture, and I need do no more than present to you the Report. If any Fellow is desirous of bringing forward a motion on any point in the Report of the Council he will have an opportunity of doing so in a few moments. You will remember that the Bye-Laws provide that no resolution shall be passed at this Annual General Meeting. If any Fellow wishes to bring forward a motion on any point, that motion, after he has briefly explained it, should be handed in, read to the meeting, and referred to a Special General Meeting, which will be done provided that the motion is supported by not less than forty Fellows present.

But it will be convenient if we take first the fourth item on the Agenda—the election of Council and Officers for the ensuing year. I will ask the Scrutineers to come to the table and receive the balloting papers of Fellows. While they are scrutinizing the ballot we will deal with any motion arising from the Report of the Council, and I will then ask the Scrutineers to announce the result of the ballot.

There being no questions or comments the Report was unanimously adopted by the Meeting, after which the Scrutineers informed the Deputy President that the Candidates proposed by the Council had been elected.

THE ANNIVERSARY DINNER

The Anniversary Dinner was held at the May Fair Hotel on Monday 20 June 1938.

Colonel Sir Charles Close (Past President of the Society) received the company, which included among the guests of the Society, Major-General the Earl of Athlone and H.R.H. the Princess Alice, H.E. the Belgian Ambassador, H.E. the Chilean Ambassador, H.E. the Finnish Minister, the Chief of the Imperial General Staff, Air Marshal Sir William and Lady Mitchell, the Master of the Rolls and Lady Greene, the Dean of Westminster and Mrs. de Labillière, the President of the Royal Society, the President of the Netherlands Geographical Society and Mme. Kleiweg de Zwaan, the President of the Royal Astronomical Society and Mrs. Spencer-Jones, the President of the Institution of Electrical Engineers and Miss Lee, the President of the Alpine Club, the Director of the Natural History Museum and Mrs. Forster-Cooper, the Mayor and Mayoress of Westminster, the Deputy-Master of the Mint and Mrs. Craig, the President of the Manchester Geographical Society and Mrs. Osborne, Dr. L. Haden Guest, Mr. Martin Lindsay, Mr. Thomas Hay, and Mrs. Haly.

After the Loyal Toasts the EARL OF ATHLONE said: Princess Alice and I are indeed very happy to be the guests of the Royal Geographical Society to-night. Only we regret, as I feel sure all those present do, the absence of your President, Professor Balfour, and especially the reason for his absence.

I have read with great interest the history of the foundation of the Society and, although in these days it is not easy to keep up the membership of any Society, I trust that more members will be tempted to join and so assist the great work which has been and is being done by this Society. I am sure I am expressing a general wish in hoping that the Mount Everest Expedition may finally achieve its objective. Whether it does so to-day or to-morrow does not matter, but I feel certain that that gallant band of explorers which has fought so man-

fully against the elements and the many overwhelming difficulties does deserve success.

Both my wife and I are indefatigable travellers: I do not know whether she caught the infection from me, or whether the germ was latent in her before we married, for I had the good fortune as a young man to spend some time in India and in South Africa, and by the age of thirty I had visited all the Dominions overseas and many Colonies flying the Union Jack, with a number of foreign possessions thrown in. Our joint travels took us to Siam, the Malay States, Ceylon, India, and to the West Indies. We have wandered among the vast wild spaces of South Africa, often sparsely populated by human beings but teeming with game of all sorts and rich in botanical interest. But the first great adventure we undertook was to journey home from South Africa on the termination of my appointment as Governor-General.

We left Pretoria on 9 December 1930 and landed in England on 9 May 1931, the only stretch of open sea we crossed being the Straits of Dover. We did not climb any mountains during that journey—had there been any near at hand I should certainly have been made to climb them—but we saw many places of interest and many things newly discovered. Leaving Southern Rhodesia, which counts among its treasures those wonderful and ever-controversial buildings of Zimbabwe, we crossed the Falls where now rightly stands the memorial to Livingstone and, passing through Northern Rhodesia, visited the copper mines which are some of the richest in the world with the latest and most up-to-date machinery. We spent Christmas at Elizabethville in the Congo and while there visited the Belgian copper mines and the radium mine where, I was told, a whole mountain has to be removed in order to obtain a few grains of that precious metal.

A six-days' journey down the Lualaba river through dense forest alternated with sud brought us to Stanleyville, and from here we started by car for Rhino-camp on the banks of the Nile which, as you know, is not far from the Murchison Falls, where we saw for a second time white rhinoceros: we had already seen them in Zululand. I believe those are the only places in which the white rhino exists. After a month's stay in lovely Uganda we motored over the border into Mongalla Province of British Somaliland, passing through some fine scenery on the way. Here we both shot the much-coveted "Mrs. Grey," an antelope which frequents swampy ground, as we found out to our cost. And so on by boat down the Nile to Khartoum with all its past history, much of which many of us vividly remember from our youth.

Once more we took boat down the Nile to Luxor and Cairo. A month in Jerusalem followed with our friend Sir John Chancellor, when we explored Palestine to our hearts' content and even penetrated to the ancient city of Petra in Trans-Jordan. Thence through Syria and Turkey, where we were the guests of the Atatürk at Ankara, and back to England by the Orient Express. A grand trip and one undertaken in great comfort, very different from the dangers and discomforts which the old explorers experienced.

I now come to what sounds the most romantic and the most difficult of our journeys, our recent visit to Arabia as guests of His Majesty King Abdul Aziz, better known as the famous warrior, Ibn Sa'ud. There is romance for those who seek it, but the Arabia of the 'Arabian Nights' has vanished; the Arabs have turned to strict and simple ways of life, spurning the riches and luxuries of the world. But of difficulties and dangers to the favoured guests of the King there were none, and nothing could have been more perfect than the Arab organization of our motor journey from Jidda, which we left on February 1, till we reached Daharan where an American company struck oil for King

Abdul Aziz on March 16, the very day we said we should reach the Persian Gulf.

We spent the greater part of the time in comfortable tents, and I have never seen a camp pitched so quickly, nor so much better than I ever found it happen in the Army. But whenever we reached a town we were most comfortably and hospitably lodged in palaces. We were obliged to make a day's journey north to avoid touching Mecca. There is a road, called the Christian Road, which leads round Mecca, and it was upon this road which rises from the coast to the high 4000-foot plateau that we had our one real difficulty, caused by the heavy rains which heralded our arrival at Jidda. We reached Taif on our second day out, a charming place composed mainly of summer villas belonging to the residents of Mecca and Jidda, pleasantly situated in the hills with gardens and vineyards. There were not many there when we visited the place and therefore we found an empty house. I think we lodged in the zenana. Wherever it was, I can assure you we were quite sorry to leave so soon again for Riyadh. This took us four days over hard stony ground, very sparsely covered with thorn scrub and tufts of grass, the drought having added to the barren aspect and driven birds and beasts away north, to our great disappointment. I did not see even one gazelle, and yet they are supposed to frequent that part of the country. We crossed one great belt of sand-dunes known as the Dahna and then came down on to Riyadh, a beautiful mediaeval walled city in an oasis. We lived however 2 miles out in another oasis, all gardens and date palms, very pleasant to the eye, in a house which has modern sanitation.

From there our road, or no road, took us in a steady slope down to the fruitful and well-watered oasis of Hufuf, another walled and towered city. The springs and streams and canals which stretched for several miles were a most gladdening sight in the midst of complete desert. Those streams flow, unfortunately, into a lake in the desert and at the moment there are no inhabitants near the lake to make use of the water. They are however getting the Badawin to settle down and I was told that no doubt there will in time be 150 settlements. Here are bred the celebrated Hasa white donkeys and splendid Arab horses. The donkeys are rather larger than most donkeys one sees, and have long ears. And so to our very real regret we came to the other side of Arabia, leaving behind us the memory of great kindliness and great friendliness and having in our hearts admiration for the fine people who had made our voyage such a delight.

I feel I have been telling our life story; I have been so long. I can only apologize, because I am here mainly and particularly to propose the toast of the Royal Geographical Society. That I do with the greatest possible pleasure, and I add my hope that the membership of the Society will increase. I congratulate the Society on the new appointment in selecting Field-Marshal Sir Philip Chetwode, an old friend of mine, to be President. I am sure he will do as well for the Society as he has done for the British Army.

I now ask you to drink the toast of the Society, coupled with the name of Colonel Sir Charles Close, our Chairman to-night.

The CHAIRMAN, in responding, said: We shall all of us agree with the Earl of Athlone when he said how we regret the absence of our President. I had to-day a letter from Professor Balfour in which he said he had been most anxious to attend this dinner, but that this had proved impossible owing to his illness. I am sure we all wish him a speedy recovery.

The proposer of this toast made some kind remarks with regard to the Royal Geographical Society. He hoped we should maintain our membership, which I hope we shall and also that we shall increase it. It can be done and no doubt it will be done. In particular, we value the Earl of Athlone's remarks

because he and Her Royal Highness are such wonderful travellers. They have seen a great deal of the surface of this little world on which we live. And after all it is a little world; we cannot get off it and we have to make the best of it.

We have in this Society done our best to encourage travel and exploration. That has been our staple industry, so to speak, for one hundred and eight years, because in the month of July we shall be one hundred and eight years old, but it is perfectly certain that primary exploration must gradually come to an end. We have had that in view for some time. We realize that the main features of the Earth are pretty well known. There was a time, as I very well remember, when we looked upon the South Pole as a region of polar calm. You have only to go there to find it is not. The various countries are gradually being explored and there are very few regions in the world of which we do not know the main features. But there is still a field for exploration and adventure, as is witnessed by the accounts we have heard at the Annual Meeting this afternoon of the Shaksgam expedition by Mr. Shipton, and of the Graham Land expedition under Mr. Rymill. When we think of the latter expedition we do not forget Lieut. Ryder, who was in command of their ship, the *Penola*. It is quite true that, to some extent, we have lived on snow and ice; but there are not many other areas on this world's surface where one can find a totally unknown country: a country in which no civilized person has previously travelled.

If that is the case, and I think it is going to be increasingly the case as years go by, we must make up our minds that geography has a much wider scope than mere exploration. In particular we deal with distributional problems. And we are not the only Society dealing with distributional problems; for instance, our sister society, the Linnean, has been studying the geographical distribution of that sagacious and adhesive animal, the limpet. They have derived a great deal of comfort out of that study, and there is no doubt that it is a valuable biological activity. But after all our main study is humanity, the study of the Earth as the home of man, and although the limpet is our very distant relation, still we think that we have advanced since his particular stage of existence.

That brings me to the subject of human geography: a difficult subject in some people's minds, because it is connected with economics. There is also an impression that it is an exceptionally dull subject. When an economist talks to you, it is sometimes difficult to know what he means, and if you read any of his books you become rapidly involved in what Mary Kingsley used to call a word fog. But we are very much concerned with distributional problems and to prove that I have only to say that a Royal Commission on the Geographical Distribution of the Industrial Population in Great Britain has recently been appointed. Our Society has been honoured by a request from that Royal Commission to give evidence before it and Professor Taylor, who presided over the committee, has prepared our memorandum.

Another undertaking which shows that in this country we are not altogether oblivious of the study of human geography is that very remarkable production, the Land Utilization Survey, which is really due to the initiative of Dr. Dudley Stamp. It may be news to some present that the field work of this Survey which covers the whole of Great Britain is practically finished; that a great many of the maps are issued, and that it only remains for every one here to buy them and thus help the Land Utilization Survey.

That brings me to the discussion of maps in general and, if I may, I would indulge in a very brief technical remark; that is, I would like very much, as representing this Society for the moment, to congratulate the Ordnance Survey, under Brigadier MacLeod, on the very remarkable work they have done

recently. They have not only carried out a new triangulation of this country quite unobtrusively and very satisfactorily, but they have done away with that very troublesome difficulty which existed for us for many years: namely, the discontinuity at the county boundaries. The Ordnance Survey have abolished all that and I think we may congratulate them.

Talking of maps for a brief moment I may say that the surveyor in the East has one kind of perennial difficulty: if he makes a mark on a hill the natives of that neighbourhood as likely as not are convinced that he has buried treasure, and when he leaves, it is possible that they will disturb the mark. But Sir Sidney Burrard came across an even more troublesome example of superstition, if it may be so called. He built a longitude station at Bushire at the head of the Persian Gulf, and it happened that he did this in the time of drought. He finished his observations and got some beautiful results. Then he and his party left Bushire in a steamer and he heard afterwards that the natives were convinced that the drought would never cease until they had destroyed the longitude station. So they went in a body, destroyed the station, and in a few hours the rain fell in torrents.

Lord MOYNE, in proposing the toast of the Gold Medallists, said: The list of the Royal Geographical Society's Gold Medallists goes back for more than one hundred years. It includes the greatest British and foreign names among explorers and geographers during that period. This year the three gold medals have been awarded to workers in three widely separated fields, which confirms what Sir Charles Close has just told us, that nowadays it is necessary to go very far to find new ground.

The records of the work for which these medals have been awarded have been read by most of us in the *Geographical Journal*, and we all wish to congratulate those who have received the highest award that this Society can give. I do not know why I have been asked to speak about it; I much wish it could have been someone better qualified from the technical point of view. I can only imagine that I have been selected from the point of view of contrast, because it so happens that on a good many wanderings throughout the world the most important pieces of information that I have been able to send to the Hydrographer of the Navy have concerned the location of a war wreck, a coral reef, and a pinnacle rock on which I have either stranded a ship or sunk it. It appears that for those reasons, in the opinion of those responsible for this evening's toast list, I may now appreciate better than most people the value of less costly methods of surveying.

The Royal Medals have been adjudged to distinguished leaders in the field. Mr. John Rymill, who wins the Founder's Medal, learned about Arctic conditions in Greenland, and on the death of his friend, Gino Watkins, he took over his plans and pursued to success the efforts which he had made to organize an Antarctic expedition. You will remember that his expedition went to the opposite side of the South Pole to that which became known through the work of Scott, Shackleton, Amundsen, and Byrd. It went to a district which had only previously been seen from the air by Sir Hubert Wilkins and Mr. Lincoln Ellsworth, and it found that the British Graham Land territory was considerably different when surveyed from the land than it had appeared to the airmen. Three years were spent on this work and the record of the expedition shows excellent organization and a remarkable judgment in choosing personnel. Mr. Rymill was very fortunate in his partners. He took men who were experts in their own sciences although they were amateurs in sailing the ship. Nevertheless, they took on those very difficult responsibilities in dangerous seas with complete success. In spite of the modest way in which Mr. Rymill has told of his expedi-

tion it is evident that he is a born leader in his initiative and his ready adaptation to unexpected developments.

The other medal which is awarded for exploration is the Patron's Medal, which goes to Mr. Eric Shipton. He has done great work in many mountain fields. He began with Mount Everest. The award of the medal also mentions his work round Nanda Devi and his conduct of the Shaksgam expedition of last year. On Nanda Devi his achievement was to penetrate a pass which had baffled the great mountaineers who had previously tried it, and thus to open up the inner basin and the slopes of Nanda Devi, on which no one had previously set foot, to a survey party and to mountaineers who were able to conquer the peak. His Shaksgam expedition has thrown new light on many interesting problems, and in the discussion which succeeded the paper he read on that expedition he revealed the reason for his success. He said that he had never been attracted by climbing peaks so much as by finding his way about unknown country, working through a pass between one region of mystery and another, and in spite of the fact that he is a great mountaineer and has been 28,000 feet up Mount Everest, it is because he has this instinct for exploration for its own sake that he has been able to do some of the best work for many years in penetrating these unknown districts and in enabling full information to be obtained about them.

Both the Royal Medallists are, unfortunately, at the other end of the world and therefore cannot be with us to-night. But the Victoria Medallist, our old friend, Mr. Hinks, will no doubt speak on their behalf. Mr. Hinks has received his medal for research, for great achievements in geodesy, in the application of mathematics to the figure and size of the Earth. When Mr. Hinks twenty-five years ago came to the Royal Geographical Society he was already a most distinguished mathematician. He had in 1912 received the Gold Medal of the Royal Astronomical Society and had been elected a Fellow of the Royal Society. Since that time he has specialized in geography, and when I was asked to commend this toast to you I found out the exact grounds of the award. When I saw on the list 'A graphical discussion on the figure of the earth,' and also his book on map projections, I went to the Librarian and asked for them. When I sat down yesterday to read them I very soon gave it up because I at once realized that they are far beyond my own comprehension. I always find however that at the R.G.S. meetings one gets very good value out of the remarks which follow the paper, and I found a statement made during the discussion of one of Mr. Hinks' papers which I would not dare to repeat if it had not come from another very eminent mathematician: that one of the great qualities of Mr. Hinks was that in spite of his handicap as a mathematician he was able to temper mathematics with common sense. That is an extremely comforting thought to a great many of us. When we cannot understand mathematics we may in future hope that it is because of the lack of common sense of the mathematical exposition. But there are qualities in Mr. Hinks which we can understand; qualities which distinguish the man who has clarity from the man with obscurity of thought. If one looks at his other works such as 'Maps and survey' and 'Hints to travellers' one realizes that he sees his subject so clearly that he is able to explain even technical matters in such a way that completely ignorant people like myself find them of absorbing interest.

I give you the toast of The Medallists, coupled with the name of Mr. Hinks.

Mr. A. R. Hinks: Fate has ordained that only one of us three should hear the generous words which Lord Moyne has spoken of the Medallists of the year. The two Royal Medallists, the men whom you would have wished to see and to hear, have silently stolen away, like the Arab, according to the poet;

though I have it on good authority that in imagining the Arab packs up and moves off in silence, the poet was mistaken.

John Rymill, the Founder's Medallist, is for a few weeks at his Australian home, whose name, Penola, has been made immortal by the ship which took him to the Antarctic. Rymill, I am sure, regrets as much as you and I that he is not here to respond, to attribute all the merit to his companions, and to assure you of his resolve to extend, with their help, what even international lawyers at The Hague would admit is an effective occupation of Graham Land, that remote and little-known dependency of the Falkland Islands in the British Commonwealth.

Eric Shipton, the Patron's Medallist, has gone off with that resolutely silent band of mountaineers who are determined to tell us nothing at all until they have arrived at the summit of Mount Everest. Shipton, if he were here to-night, in the midst of this plenty would dwell if only in thought upon the superior merits of *tsamba*, that parched barley-meal, and the shoots of the young bamboo; and, following in the steps of Mr. Freshfield, he would insist, as Lord Moyne has said, that mountain exploration is the real thing, even if by the way he may by this time have stood 29,002 feet above sea-level.

But fate has ordained that I alone, masquerading here as a mathematician, should have to say a word on those two charming branches of geography, Map Projections, and the Figure of the Earth, in which a little knowledge has brought me the high distinction of the Victoria Medal. Map projections is a subject which remained, one might almost say, crystallized for nearly a century, and suddenly came to life in the middle of the Great War. Since then the *Journal* has from time to time produced a little burst of new map projections, and another is nearly due. I may reveal to you on this privileged occasion that very shortly your Chairman will lay before an admiring world a new map projection, a Polar Azimuthal Retro-azimuthal Projection, of a Hemisphere, and he is deterred from recommending it for the other hemisphere only by the fact that there the Equator runs into the Pole. Can any one deny the charms of a subject which has such possibilities, or the interest that we poor mathematicians may find in it? And then there is the question of the Figure of the Earth. The numbers which denote the size and the shape of our Earth were settled for us by the vote of an International Congress which met at Madrid in 1924, but I am not alone in thinking that there is still something to be said upon the subject. "With a little foundation of learning withal, and leisure and opportunity to work upon it, how deliciously may an old man enjoy himself." I hope within a short time to be able to assure myself, fortified by the award of this medal, that Cicero was right when he said that. And so, for my good friends Rymill and Shipton and for myself, I thank you with all our three hearts for the honour which you have done the Medallists in this Toast.

Field-Marshal Sir Philip Chetwode then said: I have this evening the pleasant task of proposing the toast of The Guests of the Royal Geographical Society. It may sound pleasant, and it is, but I am in rather a painful position, not the most painful position of all the speakers in this room: that will be for the man whose name I am going to couple with this toast, the Master of the Rolls, because after the extraordinarily skilful exhibition of oratory we have had to-night it is not easy to get up at the end of the evening when everybody has had about enough. It is a very dangerous position to be in, because if you say too much you are apt to be "put on the spot" by other members of the audience. But it is also not too easy for me, as a soldier who has spent all the best years of his working life in teaching other people how to kill the king's enemies with efficiency and dispatch, to propose the toast of so many learned

and distinguished people. Moreover, when I looked them up in books of reference I found they were so wise and their performances so learned that in many cases I had to look up in the dictionary the meaning of what they had done.

I propose to run very quickly through the names of the guests, if they will permit me to do so. First, of course, I must mention Her Royal Highness, and, if I may say so, my old friend the Earl of Athlone. It was my privilege to know Lord Athlone for many years as a fellow cavalry soldier. I did not know him very long before I realized that he and his lady were following in the traditions of their family, that tradition which means that no trouble is too great, and no time wasted, in the public service. Undoubtedly the biggest work they have done was when Lord Athlone undertook the Governor-Generalship of the Dominion of South Africa. In that appointment they endeared themselves to all parties in Africa and did great service to the Empire in what was a very critical time in the history of the Dominion.

We have here also H.E. the Belgian Ambassador, a very old friend of England, and welcome wherever he goes throughout England, not only for himself but as representative of Belgium with which we English people have so many close ties. We have also with us H.E. the Chilean Ambassador who is an honorary member of the Society and represented his country at our centenary in 1930. We have also H.E. the Finnish Minister. The Geographical Society of Finland celebrated its fiftieth anniversary in January last and we are proud to welcome a representative of that country.

We have with us my old friend General the Lord Gort, who at a comparatively early age was called upon to assume one of the most responsible positions in England, to be the principal adviser to the Government on military matters in what is undoubtedly one of the most critical times in our history. I am quite certain, knowing him as I do, that he will succeed in that appointment, the responsibility of which would, I think, shock some people here to-night if they knew the number of problems, sometimes almost insoluble, which are put before him every day. The Air Force is represented by Air Marshal Sir William Mitchell, with whom is Lady Mitchell. He is responsible, as Air Member for Personnel of the Air Council, for raising the personnel of an enormously increased Air Force.

We have also a very distinguished member of the legal profession, the Master of the Rolls and his lady, Lady Greene. In addition to being a great legal luminary, he also served with great distinction in the war in France, in Flanders, and Italy, and on the staff of the Fifth Army.

The Church is represented by a distinguished Dean, the Dean of Westminster. He has only recently taken up his duties there but, as you know, as the Dean of the Royal Cathedral Church of Westminster I believe he is the only person in the world who can make the Archbishop of Canterbury shiver. It has always been my ambition to make an Archbishop shiver.

Then we have with us the President of the Royal Society, Sir William Bragg. I looked him up in a book of reference and found two pages about him which I will not tell you at this late hour. I merely say that he is a doctor of no less than seven universities. There is also the President of the Royal Netherlands Geographical Society and Madame Kleiweg de Zwaan. The National Geographical Union meets in Amsterdam in July and he represented his Society at our centenary. We are proud to welcome him to-night. Then we have with us the President of the Royal Astronomical Society and Mrs. Spencer-Jones. We also welcome the President of the Institution of Electrical Engineers and Miss Margaret Lee; he is Engineer-in-Chief to the General Post Office and

Chairman of the Radio Research Board. We have here the new President of the Alpine Club, Sir Claud Schuster, who is Clerk at Chancery and Permanent Secretary to the Lord Chancellor. The President of the Natural History Museum and Mrs. Forster-Cooper; the Deputy Master of the Mint and Mrs. Craig, the Mayor and Mayoress of Westminster, and Dr. Haden Guest, who is Secretary of the Leverhulme Trust which sometimes provides travelling fellowships for geographers, are also amongst our guests to-night.

I give you the toast of our Guests, coupled with the name of the Master of the Rolls.

The MASTER OF THE ROLLS (Sir Wilfrid Greene) in responding, said: Sir Philip Chetwode has told you that one of his ambitions is to make an Archbishop shiver. In his opening remarks there was a sentence which led me to suppose that something terrible was going to happen to me. I am glad to say that there was nothing he said about me to which I could take exception; therefore the shiver has never taken place. I find nothing but pleasure in responding to a toast so gracefully and wittily proposed and so charmingly accepted.

To me personally there is an especial pleasure in responding, because when I cast my mind back to a time rather less than twenty-four years ago I little thought then that the day would come when I should be responding to a toast proposed by a Field Marshal, and responding for, among others, the Chief of the Imperial General Staff. Those were the days when territories inhabited by generals were to me very like the territories used to be to the makers of old maps when they came to a part of the world with which they had imperfect acquaintance: they used to indicate by pictures or by words that the land was inhabited by wild beasts and demons. I am pleased to be able to say that those early impressions on closer acquaintance were entirely changed. At last I am in a position to stand up to the generals, to look them in the face and remind them, if I may, that whereas there was a time when it was within their power to order me to do a lot of unpleasant things I did not want to do, if they ever misbehave themselves anywhere in the neighbourhood of my court they will find that His Majesty's judges can make even generals do unpleasant things. So much for the generals.

Now, as to the geographers. I am not ashamed to admit that until this evening I had never to my knowledge met a geographer. I discovered however on looking round this room and seeing many faces of friends, that, without knowing it, I have been consorting with geographers all my life. At this very table is Sir William Goodenough. He always represented to me that he was an admiral, but that is merely a subsidiary activity. I now discover that his principal function is that of geographer.

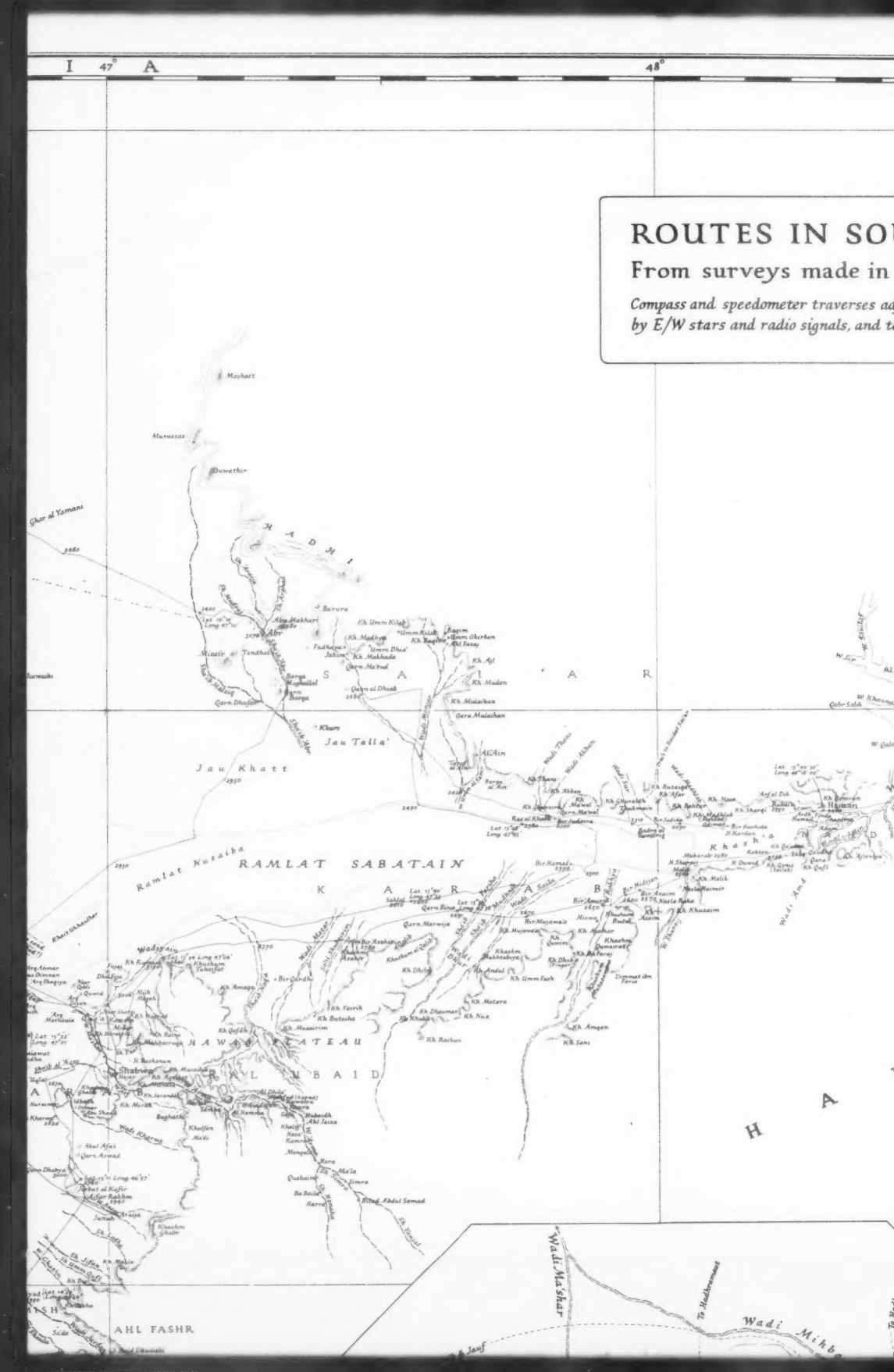
It is odd, when I come to think of it, that I should not have come across geographers, because in the profession of the law we sooner or later come across every variety of human activity. Starting at the lower stages with the butcher, the baker, the candlestick maker, brewers, ballet dancers, bankers, financiers, electricians, chemists, mechanics, anything you please, sooner or later the law comes into contact with them. The law learns a great deal from them and I venture to think they sometimes learn a great deal from the law, particularly when they have to appear as expert witnesses and be subjected to what we call a severe cross-examination. But geographers somehow have always managed to keep out of it. Whether that is due to some deplorable lack of the fighting spirit or because their science is so remote from everyday life that it never comes to such a sordid place as the Law Courts, I do not know. But I think it is a defect which the members of the Royal Geographical Society, if they have any public spirit, might endeavour to remedy.

I have always wanted to meet a geographer, not merely because I was quite sure that he would be a person of eminently sprightly conversation and cheerful manners but because there is a question I am particularly anxious to put to a geographer. I do not know whether many in this room ever read the books of that great writer, Sir Thomas Browne, but at the end of one of his books entitled 'The Garden of Cyrus,' written when he was probably feeling very sleepy, there is a sentence: "The huntsmen are up in America and those in Persia are in their first sleep." That is a noble sentence because he is pursuing the majestic march of the sun across two hemispheres and uniting it with the thought of the common occupation of simple men. I did not mention that sentence for the purpose of stressing its nobility but because I want to find out at what time of the day it was written. At last I believe I have an opportunity of getting an answer. May I repeat the sentence? And remember that the writer penned it at a time when he was naturally feeling very sleepy: "The huntsmen are up in America and those in Persia are in their first sleep."

I appear to have occupied more of your time than the last speaker ought to occupy, and I was quite properly reminded by Sir Philip Chetwode that the sands were running out. I conclude by saying, on behalf of all the guests, how much we appreciate your kindness and hospitality to-night, and how grateful we are not merely for the noble entertainment you have given us, but for the kind way in which you, Sir Philip, have proposed this toast and the very cordial way in which you, ladies and gentlemen, have accepted it.

45°
S A 'U D
46°
17°
16°
15°
Y E M E N A R A B
R u B '
Y A M
Annab
Dhaba
MADHBA
Makhruden
Fuhud
Ghidan
Umm Ashlad
Murra
Sawqira
Tawila
Khabb
Dabi
Sahar
Hinna
Mahashima
Mulissa
Hayla'
Sabu
'Arf Da'if
Khamsar
Rahuma
Nagesh Abyadh
Nagesh Aswad
Nuroha
Umm Jandam
Wahtan
Qaysima
Rajila
Matan
Jau Mulais
Burq al Rajwa
Mashaimira
Zarqain
Alsad
Khalfa
Wadi Sirahan
Rass 'Arra
Wadi Rass
Wadi Aubar
Nishat Miryama
Wadi Miryama
Khuraiba
Wadi Khalifain
Asam
Shapiqa
Suwaiqa Duhaidha
AL SAWAD
Nasif
Naqil Barada
Madhra
Raidan
Shahla
Qadam
Rahwan
Jibal Shalk al Arwad
Sharj
Markaba
Mabda
Murra
Bu'a
Qarandha
Kuwaida
Nadhbat al Sharq
Nadhbat Ulya
Bani Dhabi
Hirshi
Wadi Hujaila
Dahlat
Nasratain
Udhluh
Raqma
Nadhbat ibn Jidan
Safrat Harrab
Hulaif
Umm al 'Arabi
Amad Dhu Hulaiba
Ithama
Tragis
JABAL LAUD
Zuwaira
Janfura
Hanna
Eacid
Sa'ra
Khashaiba
Tuhaidha
Umm al Ma
Nudhud
Dahaidh Aqir
Sabaq
Barqa Ashqar
MUNQIDHA
Ghurrab
Durra
Dhiba
Suh Ruhayya
Sudaihat
'ALAM ABYADH
Habi Farida
'ALAM ASWAD
Jidran
Wadi Jaur
Wadi Waisat
Track from Jaul to Sufa
J A U F
D A H M
Lisanat Ulya
Lisanat Sufla
Wadi Khamir
Wadi Saha
Ghail
Nadder
Barqa Ugsha
Wadi Helbaiten
Maswa
Khirbat Sa'id
Dhurwab
Fadhlaiya
Khirbat ibn Jidan
Kanaan
Rhuwaisa
Rumda
RAGHWAN
HIJAZ AHL JIDA'AN
Wadi Raghwan
Wadi Abrad
Tuhaiyil
Wadi Saha
Futaikha
'Ajuz
Tadanyin
Khuraiba
Batanah
Salkhum Fuhaid
Khuraiba
Dhuraiba
Kawsan
Fithwa
Dhuraiba
Khuraiba
Khuraiba
Kh

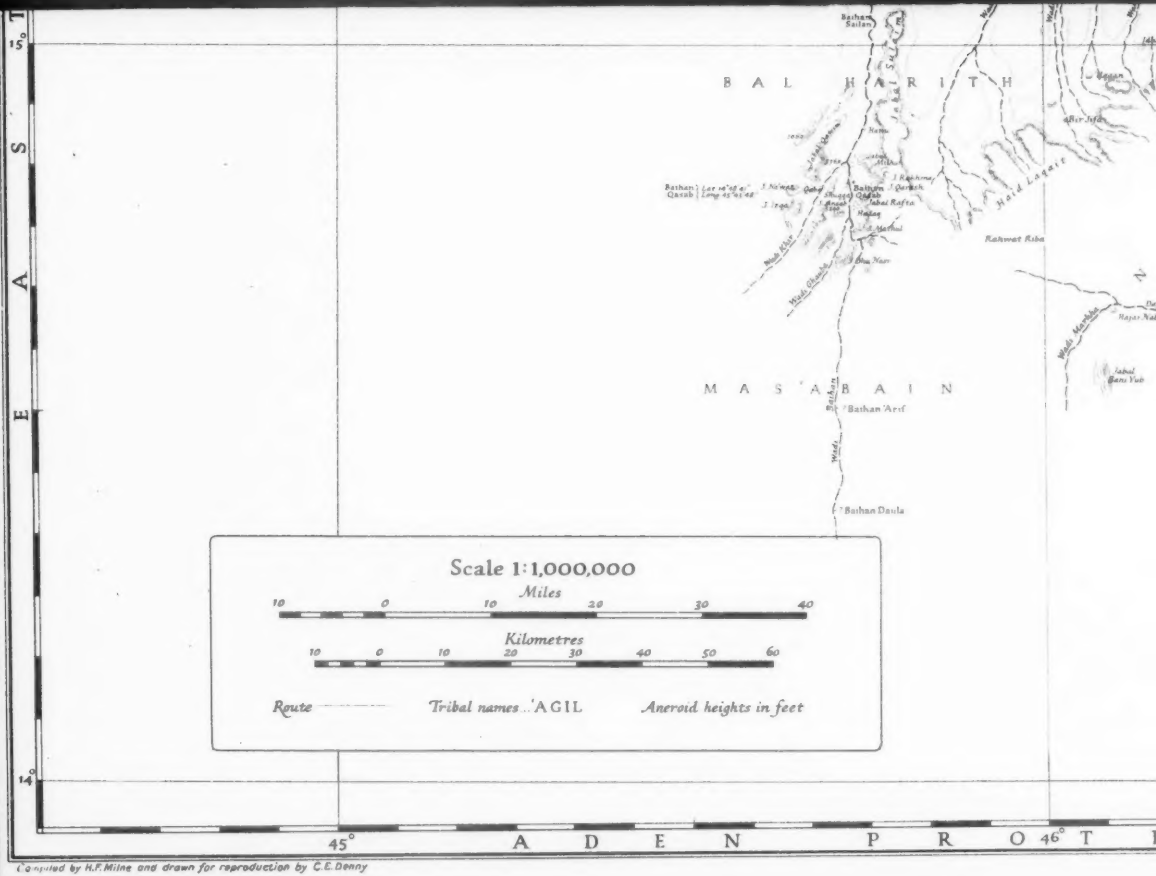
D 46° I A R A B I 47° A
A L K H A L I
Y A M
A H M
JAU MULAIS
Ramarim
Darb al Amir
Ghar al Yamama
Wadi Abrad
THANIYA
Arg al Abtar
RUWAIK
Abu Jamb Abyadh
Abu Jamb Arwad
Ramlat Nusaiba
RAMLAT SABATAIN
ARYAM
Jau Khatt
Shubrwa
Shabwa
KARAB
HAWAL
Track to Shaib Jumail and Marib
JAU KHUDHAIF
Wadi Jardan
Wadi Kharma
Antarr
Jabal Aqra
Wadi Jafra
Wadi Sarahan
Wadi Khaiwa
Wadi Jafra
Wadi Hadhramaut


I
47°
A
48°
ROUTES IN SO
From surveys made in
Compass and speedometer traverses ad
by E/W stars and radio signals, and t
Murassas
Duwather
Ghar al Yamani
H A D H I
Barura
Abu Makhari
Abr
Tandhal
Qarn Ma'tud
Qarn al Dhiab
Qarn Dhufar
Khawr Jau Talla'
Jau Khatt
S A L A A R
Khawr Mulaikhan
Qarn Mulaikhan
Al 'Ain
Ramlat Kusaiba
RAMLAT SABATAIN
K A R A B A
Qarn Marwija
Qarn Bina
Wadi Masar
Khashm al Qalib
Khashm Dhufar
Khashm Shakhtabiya
Khashm Qumairat
Khashm Azzim
Khashm Budul
Khashm Farsi
Khashm Ghubbat
Khashm Ghafr
Khashm Ghubbat
Khashm Ghafr
Khashm Ghubbat
Khashm Ghafr

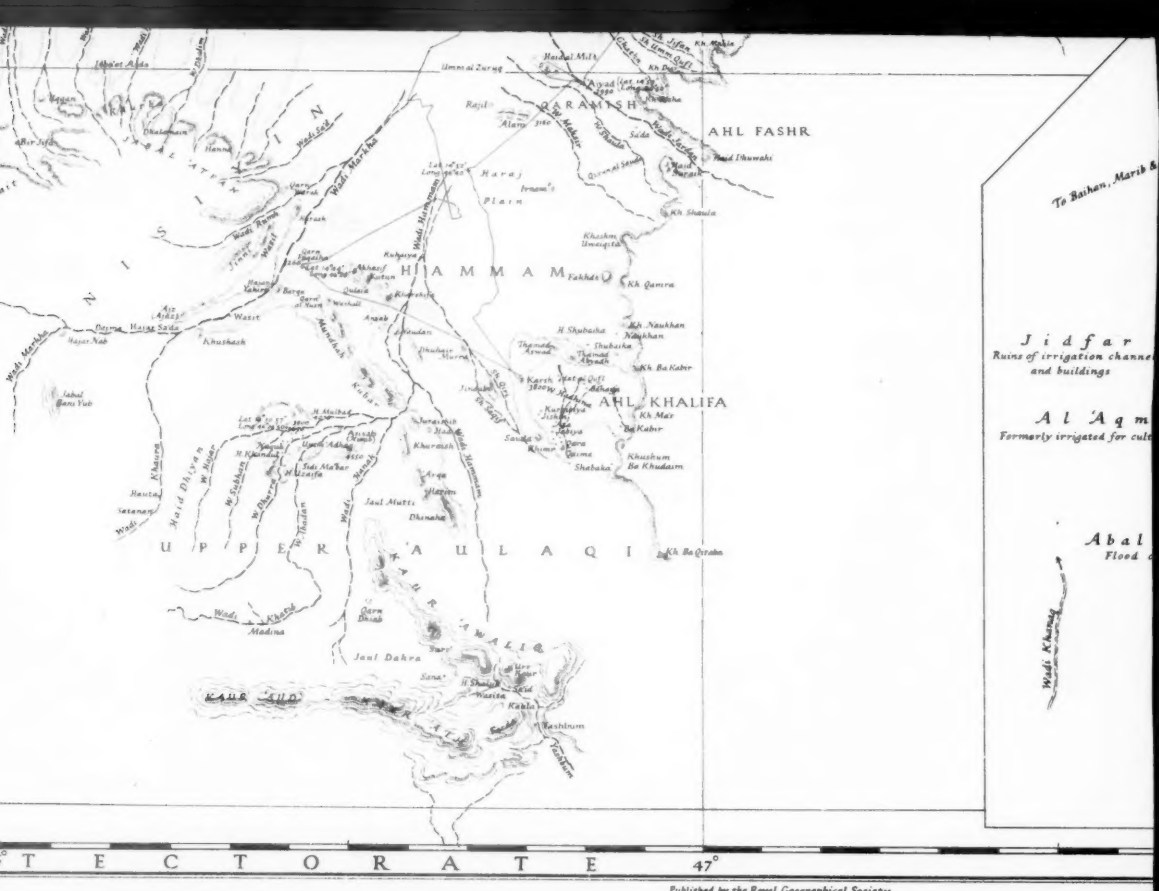
N SOUTH-WEST ARABIA

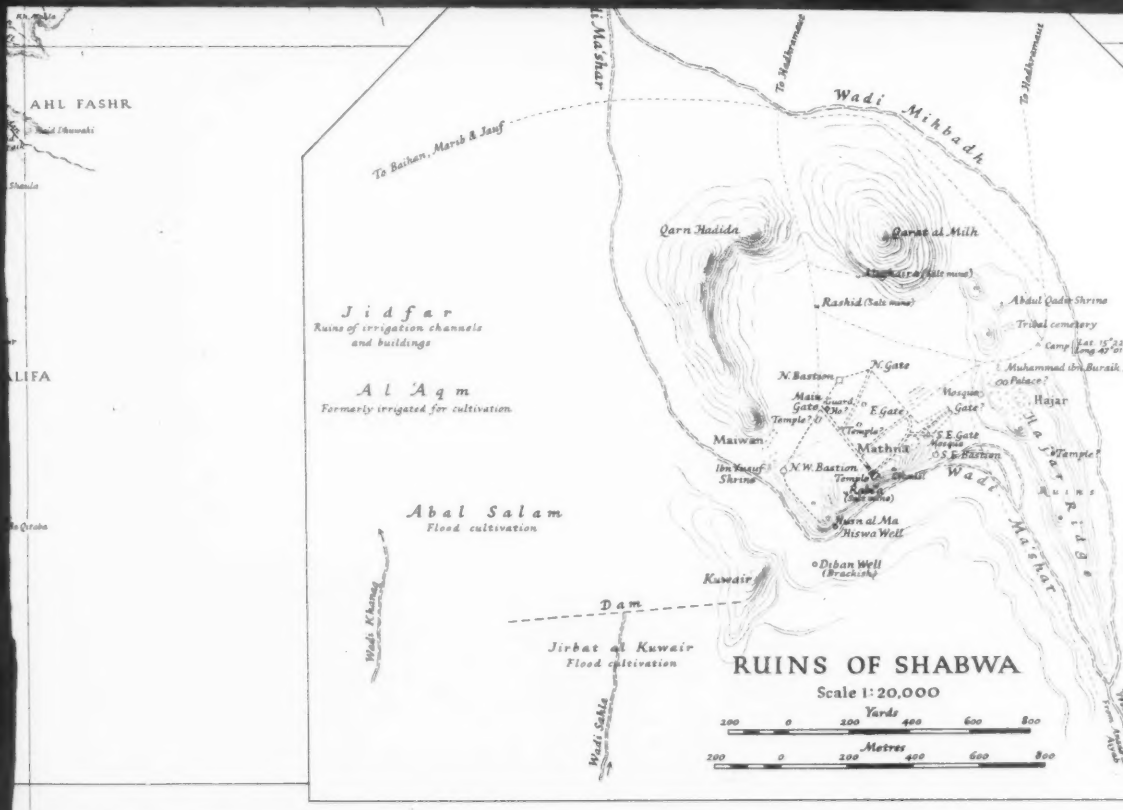
nade in 1936 by Mr. H. St. J. B. Philby C.I.E.

traverses adjusted to author's latitudes by Polaris, longitudes gnals, and to accepted positions for Shihr, Tarim and Shibam

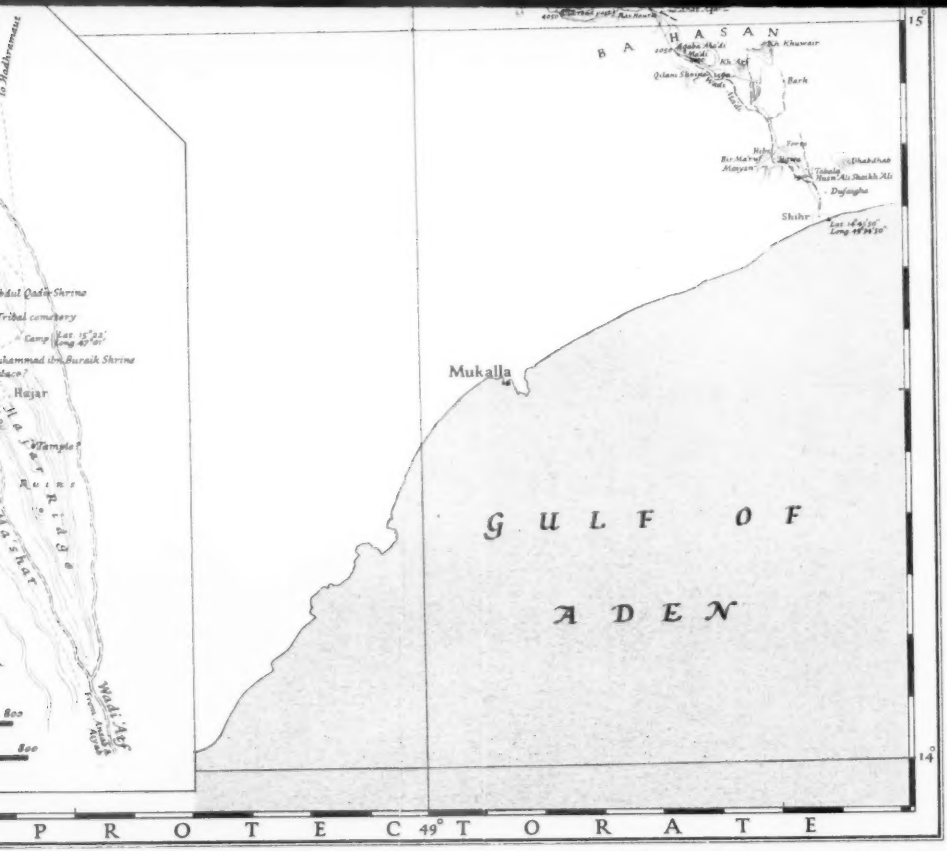


Compiled by H.F. Milne and drawn for reproduction by C.E. Denny


AHL FASHR
HIAMMAM
AHL KHALIFA
U P P E R A U L A Q I
Haraj
Plain
Jidfar
Ruins of irrigation channe
and buildings
Al 'Aqm
Formerly irrigated for cult
Abal
Flood
To Baihan, Marib &
Wadi Khamaj
Wadi Markha
Wadi Dhiyan
Wadi Madina
Jaul Dahra
Jaul Mutti
Kaur Ajlo
Kashlum
Tashlum
Khuraish
Khuraish
Khushash
Wasit
Haiya Sada
Dayma
Hajar Nab
Jabal Bani Yub
Haura
Setanara
Madina
Sana'
Kahla
Wasita
Dhamaka
Khushaim Ba Khudaim
Shabaka
Ba Kabir
Ba Qirsha
Khushaim Umeiqita
Khushaim Nauhkhan
Thumaid Abeidh
Thumaid Aswad
Thubaika
Karsh Jabrin
Karsh Qafi
Adhaqa
Saida
Khumr
Qarn Dhiab
Qarn Shaiban
Qarn Yahrir
Qarn al Nura
Qarn Sabaiha
Qarn Ashaj
Qarn Ashaj
Qarn Dhaiqa
Qarn Dhaiqa
Qarn Dhaiqa



lished by the Royal Geographical Society



SOUTH-WEST ARABIA
Philby